THE IRON AGE

Contents

March 21, 1940

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MARCH 21, 1940

ESTABLISHED 1855 Vol. 145, No. 12

Again the Machine—and Jobs!

EARLY next month the TNEC will put ***machinery*** on the witness stand in Washington. Continuous steel mills and forging machines, lathes, planers and automatic production machines of all types will be asked this question: "Do you cause unemployment?"

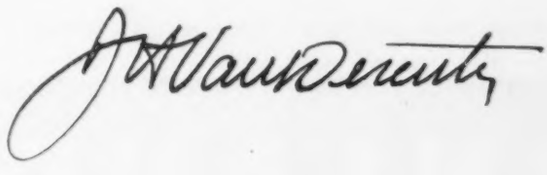
The answer that the machine gives to this question before the Senate Committee of which Mr. O'Mahoney is chairman may decide the fate of his Senate Bill S3560, introduced by him last week, which seeks to establish a system of discriminatory taxes and tax rebates for the purpose of stimulating the employment of more people in industry, as distinguished from the employment of more machines.

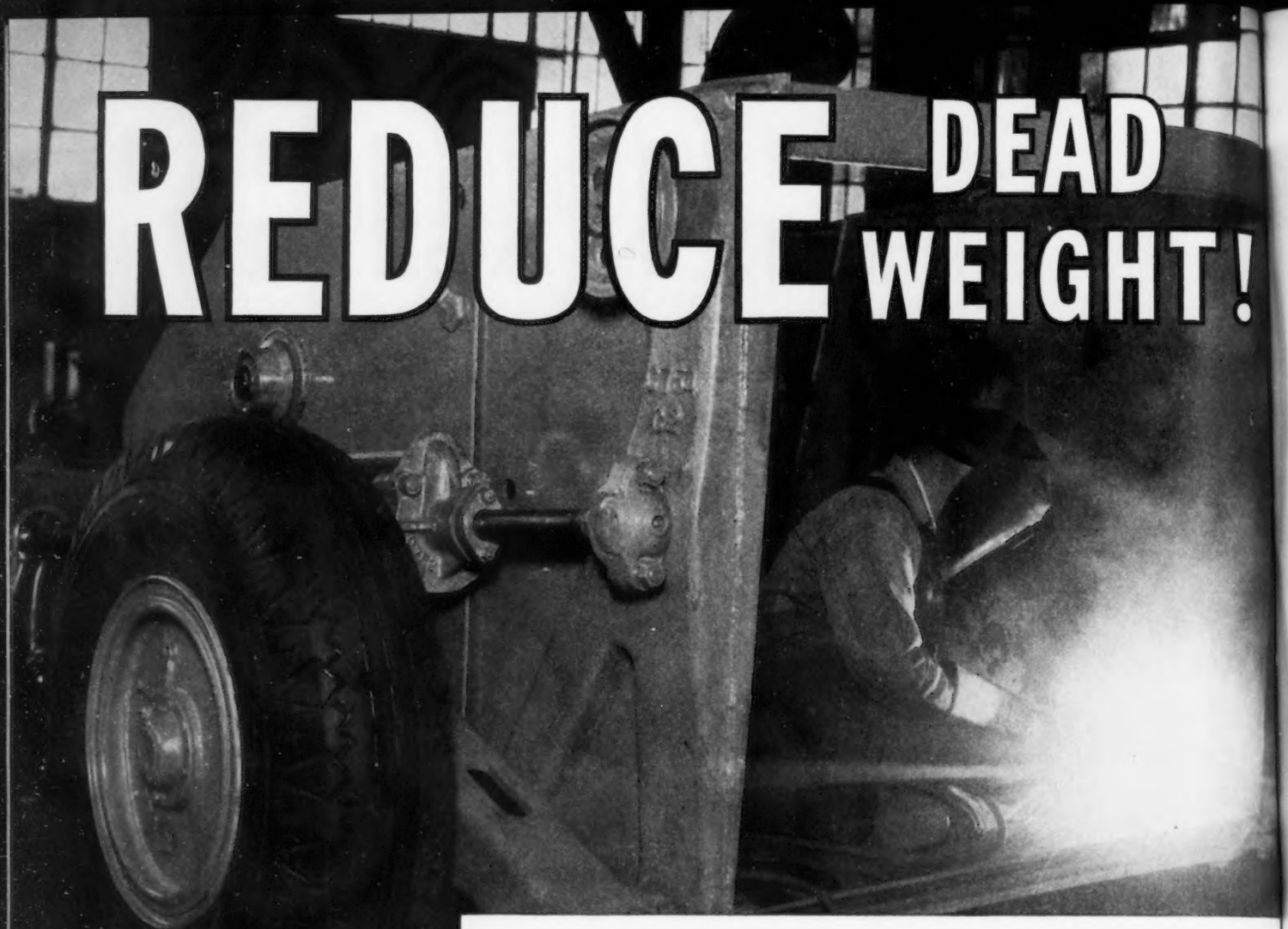
The principle of Senator O'Mahoney's Bill is based upon the theories put forward by Karl Karsten, who was formerly a WPA statistician and before that forecaster specializing in economic advice to investors. The article on which Senator O'Mahoney's Bill is based, as reprinted by his request in the Congressional Record, is briefed for the benefit of our readers elsewhere in this issue. It should be carefully read by all of those who are interested in the subject of mechanization, because of the prominence given to it and to the ideas of its author by the Senator from Wyoming, who is its sponsor.

We have no quarrel with any sincere and intelligent attempt to mitigate the hardships incident to the unemployment problem which has confronted this country throughout the whole of President Roosevelt's Administration, and we would be the last to charge Senator O'Mahoney with insincerity. Offsetting this, however, it must be said that the Senator's background during the past 20 years would presuppose an experience more intimately connected with cows than smokestacks. And this opinion is reinforced by his advocacy of a plan which reveals itself upon critical examination to be as likely to induce employers to forsake machinery for hand work as it might be to persuade the moon to reverse its course in the heavens for the sake of a one per cent tax rebate. For this proposal is not a tax on the machine, nor an incentive to employment—it is a tax on efficiency.

Our chief criticism, however, in this connection must not be directed against such well intentioned men as the Senator or Mr. Karsten, who at least are trying to do something about this problem. Censure must fall upon the employers of our American manufacturing plants who have not as yet seen the necessity or taken the pains to acquaint the public with the real facts in the matter. We have not, for one thing, demonstrated what a really small percentage of today's total unemployment is due to men being displaced by machines. With over 75 per cent of those out of work in the category of common labor which has never been associated with mechanization higher than that of the pick, shovel, and wheelbarrow, this should not be an impossible task for a fairly intelligent statistician.

Again, it's the machine and jobs. Let's hope that we get to the bottom of this matter now, once and for all.





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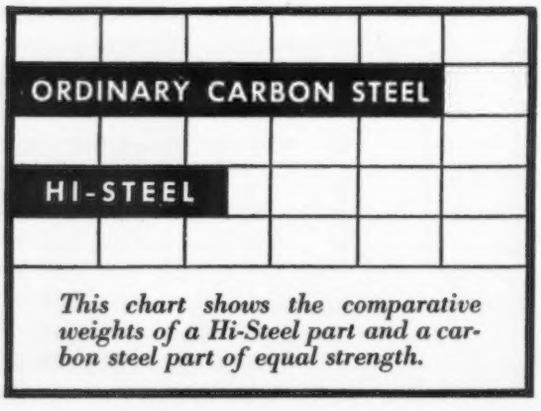

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...and President Roosevelt said, Let There Be a PACIFIC COAST STEEL INDUSTRY

o o o

T. W. LIPPERT,
Metallurgical Editor,
The Iron Age

o o o

AND there was a Pacific Coast steel industry—maybe! It all depends on what is meant by a steel industry, and how, when and where it is developed.

First, Washington (D. C.) proclaims the West Coast is ripe for the development of its own steel industry. And crowding along was a kaleidoscope of inspired statements and newspaper treacle regarding matters of military strategy—unique electric furnace technique—new wood coke fuel—revolutionary charcoal iron—Los Angeles the steel giant of the future—dirt-cheap electric power turning conventional metallurgical practices topsy-turvy. There's a vista of metallurgy bursting its bonds and opening up new frontiers. The eyes sparkle and the pulse quickens. It's all quite exciting.

Certainly the sapience of the political mind demands admiration, at least technical-wise. A new industry is born by decree. But still it all seems too casual, too simple. It brings to mind the Indiana legislator of about 20 years ago who introduced a bill to change the value of π from 3.1416 to an even 3, just to make mathematical calculations more simple.

Most of the published fumbling and confusion regarding the Pacific Coast enterprise is a reflection of the electrical reduction of the ore involved. There is a general awe of electrical power, and the reduction practice is completely strange to this country. Nonetheless, technical and cost data have been pretty well established abroad.

There is no gainsaying the fact that excellent iron can be so made, even with low-grade ore and fuel. But whether such practice on the Pacific Coast is competitive today or out-points the lowly and much maligned blast furnace are moot questions indeed. A number of factors are involved, as for instance the markets for finished product, existing competitive industry, quality and location of ore and fuel, and above all the electric power cost. Each of these factors is for the first time examined on the following pages. And, figure as the writer will, the critical power cost seems to come out to less than one mill per kw-hr.—which means the Government must dump power at far less than cost.

A STEADY intensification of activity characterizes the Far West, and the hum of enterprise there has for some time been pitched higher than in other sections of the country. An examination shows that Idaho, Arizona, Utah, Nevada, Washington, Oregon, California—the seven Pacific Coast states roughly west of the Rocky Mountains—contribute almost $3,000,000,000, or about 7 per cent of the manufactured wealth of the United States.

Somewhat over 16 per cent of the petroleum refining is done in that area; 34 per cent of the canning and preserving of fruits and vegetables; 55 per cent of the canning of fish, crabs and shrimps; 14 per cent of the canning of condensed and evaporated milk; 45 per cent of the country's lumber and timber products; over 6 per cent of the meat packing; and about 7 per cent of all other manufacturing activities, which includes a rapidly expanding airplane industry.

The population of the area is over 10,000,000, or 8 per cent of the country's total, and is growing rapidly, having increased 41 per cent between 1920 and 1930 (which was before the Dust Bowl migration), as compared with a growth of 16.1 per cent for the United States as a whole. Furthermore, the buying power of the population is definitely higher than the United States average.

How do these industries and this population shape up as regards steel consumption? First, it will be noted that the dominant industries do not involve a large steel consumption, with the obvious exception of the canning and preserving industry which requires large quantities of tin plate.

There is a regrettable absence of data relative to the distribution of finished steel products by states or regional markets either by the American Iron and Steel Institute or the United States Bureau of the Census. However, some time ago the writer by various means collected information on steel consumption in a number of different states, which data are believed to be relatively accurate.

Total steel consumption of the block of states made up of Idaho, Arizona, Utah, Nevada, Washington, Oregon and California for 1940 is judged as being somewhat more than 2,000,000 gross tons. This volume is considered as a normal market for the year and is predicated upon average business conditions obtaining. The possibility of unusual business conditions or cyclical trends is ignored.

This approximate 2,000,000 gross tons of finished steel consumption for the seven Pacific Coast states could be broken down roughly as follows:

Product	Gross Tons
Tubular products	672,840
Tin plate	382,000
Bars and light shapes	240,000
Plates	203,020
Wire, rods and wire products	191,990
Heavy structural shapes	124,760
Rails, light and heavy	127,100
Black sheets	110,390
Galvanized sheets	96,400
Angle bars, tie plates, etc.	49,980
Strip, hot and cold rolled	27,200
Cotton ties and hoops	2,900
All other	47,420
Total	2,276,000

Note the wide diversification of the line of products sold. This, and an equally wide diversification of customers, results in a complicated sales problem on the Pacific Coast, which problem would be even more complicated if it were not for the fact that there is a high concentration of sales in the Los Angeles and San Francisco districts.

The question naturally arises as to how this demand is currently being satisfied. For some time the Pacific Coast has had a rather neat little steel industry of its own although that fact seemingly is somewhat obscured by all the vocalization about a new industry. The Columbia Steel Co. (U. S. Steel Corp.) has three plants—at Pittsburg, Cal.; Torrance, Cal.; and the Pacific Works at San Francisco. All three have an ingot capacity of about 410,000 tons. Bethlehem Steel Co. has plants at South San Francisco, Los Angeles, and Seattle, with a total ingot capacity of 380,000 tons. There are also two independent steel producers: Northwest Steel Rolling Mills, Inc., at Seattle, with about 15,000 tons of ingot capacity (electric furnace with scrap charge is used); and Judson Steel Corp., Oakland, with about 76,000 tons of ingot capacity. There are also two re-rolling mills: Simmons Co., at San Francisco; and West Coast Pipe & Steel Co., Los Angeles.

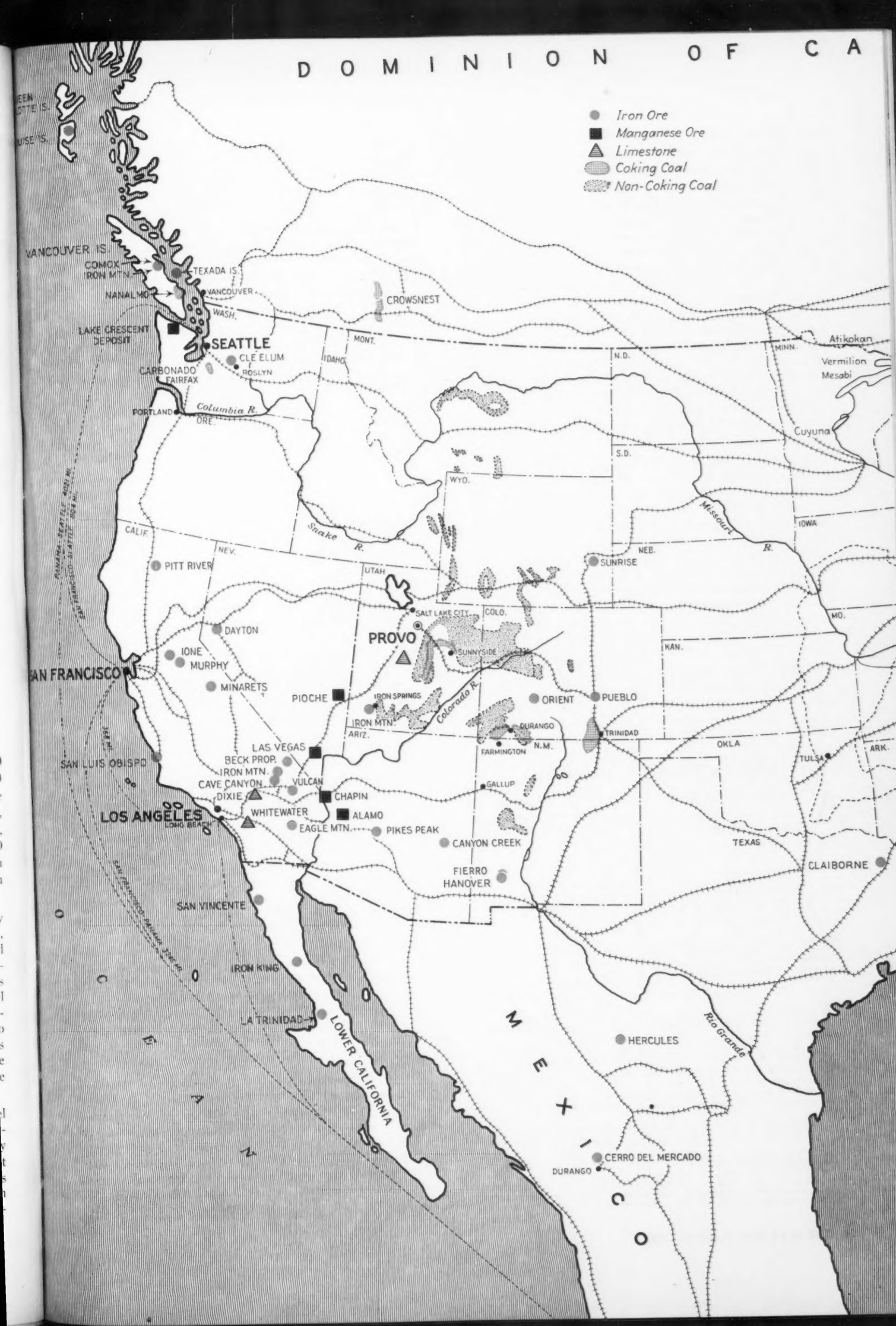
All these producers will this year contribute a probable 670,000 tons of finished steel, distributed roughly as follows:

Product	Gross Tons
Bars and light shapes	312,000
Wire, wire products, and rods	120,000
Black sheets	92,000
Tin plate	40,000
Angle bars, tie plates, etc.	40,000
Heavy structural shapes	36,000
Plates	12,000
Cotton ties and hoops	2,000
Pipe, tubes and all other	16,000
Total	670,000

The difference between a consumption of about 2,276,000 tons and a local production of 670,000 tons is 1,606,000 tons, which undeniably is a neat wad of steel. But, note that the deficiency is mostly in highly finished products, being conspicuous in tubular products (over 672,000 tons), tin plate (342,000 tons), and galvanized sheets (96,400 tons). In heavy steels there is pronounced deficiency in rails (127,100 tons), in heavy shapes (88,760 tons), and in plates (191,020 tons).

It's quite obvious from what parts of the country a goodly part of these deficiencies are made up—Birmingham, Ala., and Sparrows Point, Md., the two highly developed and integrated steel making units blessed with water transportation that permits shipment into the Pacific Coast states at an over-all freight rate less than any of the other steel plants in the United States. Of the total deficiency of 1,606,000 tons, the writer would guess that perhaps close to 400,000 tons originate in Birmingham, about 300,000 tons in Sparrows Point, and the remaining 906,000 tons come from scattered points throughout other sections of the country.

In view of the great deficiency in Pacific Coast steel manufacture and the fact that both Bethlehem and Columbia already have steel making facilities there, the query might be raised as to why the steel making capacity is not raised. The author would surmise that a slow increase is contemplated by both companies, but a quick expansion is precluded for several reasons—one is that both Bir-


DOMINION OF CA
Iron Ore
Manganese Ore
Limestone
Coking Coal
Non-Coking Coal
VANCOUVER IS.
COMOX
IRON MTN.
TEXADA IS.
NANAIMO
VANCOUVER
WASH.
LAKE CRESCENT DEPOSIT
SEATTLE
CLE ELUM
ROSLYN
CARBONADO
FAIRFAX
PORTLAND
Columbia R.
ORE.
CROWSNEST
MONT.
IDAHO
N.D.
MINN.
Atikokan
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S.D.
WYO.
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MURPHY
SUNNYSIDE
KAN.
SAN FRANCISCO
MINARETS
PIOCHE
IRON SPRINGS
ORIENT
PUEBLO
IRON MTN.
ARIZ.
Colorado R.
DURANGO
TRINIDAD
LAS VEGAS
BECK PROP.
IRON MTN.
FARMINGTON
N.M.
OKLA
TULSA
ARK.
SAN LUIS OBISPO
CAVE CANYON
VULCAN
GALLUP
DIXIE
CHAPIN
LOS ANGELES
LONG BEACH
WHITEWATER
ALAMO
EAGLE MTN.
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CANYON CREEK
TEXAS
CLAIBORNE
FIERRO
HANOVER
SAN VINCENTE
IRON KING
LA TRINIDAD
LOWER CALIFORNIA
HERCULES
Rio Grande
MEXICO
CERRO DEL MERCADO
DURANGO

mingham and Sparrows Point are excellent low-cost base-load plants from which to supply such deficiencies; and the other being a most prosaic thing, *the supply of scrap on the Pacific Coast.*

The manufacture of steel in the open hearth on the Pacific Coast is still pretty much limited by the amount of scrap available there in the open market. In general the competition for available scrap is not brisk enough to drive quotations to excessive values, and the price usually averages about $2 or so under comparative values in the East. However, a drastic change in the relation between supply and demand could wreak havoc with the scrap situation—steel making costs might well rise to a decidedly uncomfortable level. Pig iron is used with the scrap to improve the quality of the open hearth charge (conventional practice throughout the country) and to augment the raw material supply, but the amount of this iron coming from Provo, Utah,[1] restricts the use to an average of about 25 per cent of the charge (which is less than average United States practice).

With the market for steel (unsatisfied locally) on the Pacific Coast and the reasons for failure to expand existing capacity there along conventional lines both set forth so far in a series of specious steps, this discussion now comes to the projected electric furnace reduction of Coast ores as a basis of an additional steel industry there. Certainly there would be a ready market for such steel if competitive price-wise, and a new plant would likely first go into pig iron production for foundry work, and then broaden out into rolled steel—probably merchant bars, cotton ties, and rods and wire, all products which do not require extremely heavy capital investment in rolling and finishing equipment, nor concentrated loads to carry the investment charges.

The questions now of interest are potential ore and fuel supplies, the cost of electric current, and the economic and technical features of electric furnace reduction of ores.

Electric Furnace Smelting

ALL reduction of iron ore in the United States is based on pyro-metallurgy, using coke (from coal) as a reducing agent and fuel. Many years ago charcoal was employed, but as the forests fell the costs became prohibitive. *In a few countries abroad where fuel supplies are scanty and electrical power has been readily and cheaply available, the combination has lead to electric smelting of iron ores whereby a portion of the fuel customarily used has been replaced by the electric power.*

The principal development of this practice has been in Sweden and to a lesser extent in Norway, Finland, Italy, Japan and southern France. In past years there have also been several abortive efforts to develop similar practice in Canada and the United States.

In all those countries in which electric metallurgy has expanded, the process is used almost exclusively for the production of *pig iron.* After the pig iron is so produced it has to be converted into steel, and the fuel for that purpose is usually (as it is in this country) of an ordinary type such as gas or oil. And of course the production of steel from *scrap* in the electric furnace of the arc or induction type is common throughout the world, being used extensively in the United States (for instance, Northwest Steel Rolling Mills, Inc., mentioned earlier in this article).

However, the combination of *pig iron* production by electric power and *steel* therefrom by electric power is rare. To the author, there are certain fundamental features which make the conversion of pig iron into steel in an electric furnace an uneconomical operation if other means are available.

All the recent discussion of a new Pacific Coast steel industry has centered in the use of electric power for *pig iron* production, drawing current from Federal power projects in Washington, Oregon and Arizona, and perhaps also from the Central Valley project of California. Not only will the making of pig iron in that manner be discussed, but the making of ferroalloys, and the conversion of pig iron into steel by means of electric power will likewise be covered, as these latter two Pacific Coast possibilities have also several times been suggested. There is a fair volume of foreign literature available regarding the technical features and cost of such electric furnace conversion, and information from this literature[2] will be drawn on heavily in examining the technical factors and costs involved.

The production of *pig iron* in an electric smelting furnace is a simple operation and has been brought to a maximum state of efficiency in Sweden where three factors contributed to its success: high-grade ore, cheap power from hydro-electric stations which have been easily developed, and forests from which timber for the production of charcoal could be obtained cheaply. In other countries where these conditions were not so favorable the operations have been less successful. Norway has some supplies of good ore, cheap power, but has lacked charcoal. Consequently, there have been attempts to use coke but in two or three outstanding experiments the enterprises failed for reasons which at that time were inherent in the use of coke instead of charcoal. Later developments led to some success with a mixture of charcoal and coke or with coke alone but with some increase in power consumption.

The furnaces originally used in Sweden somewhat resembled the coke blast furnace customary in the United States. Later, there was a modification of the furnace lines and a construction developed which somewhat resembled an electric steel furnace above which was a small blast furnace shaft. This has been satisfactory where charcoal is the reducing agent. Most of the Swedish furnaces now operating are of this type.

The difficulties with the use of coke as a reducing agent

[1] Columbia's furnace at Provo has an available coal supply (own, and by Government lease) for a probable 100 years operation. The coal makes a weak coke but one which has given excellent results in the blast furnace. The ore outcrops on the side of Iron Mountain in southwestern Utah, 244 miles from the blast furnace, and is mined from open pits. The ore averages 54.5 per cent Fe, is non-Bessemer in character, and is available in quantities sufficient for about 100 years. Limestone in ample quantities is nearby. Iron production generally is about one-half foundry grade for merchant sale the other half being steel-making grade for own use.

[2] "Electric Smelting of Iron Ore in the Norwegian Spigerverk Furnace," by I. Hole, *Jernkontorets Annaler,* v. 121, pp. 667-75, 1937.

"The Tysland-Hole (Spigerverk) Furnace For Smelting Iron Ores," by I. Hole, *Teknisk Tidskrift,* v. 69, Bergsvetenskap, No. 2, pp. 9-11, Feb., 1939.

"Erzeugung Von Roheisen Mit Helfe Elektrischer Energie," by R. Durrer, *Ztschr. Elektrochem.,* Vol. 42, No. 6, 1936.

"Low Shaft Siemens and Halske Furnace," by R. Durrer, *Stahl und Eisen,* April 14, 1938.

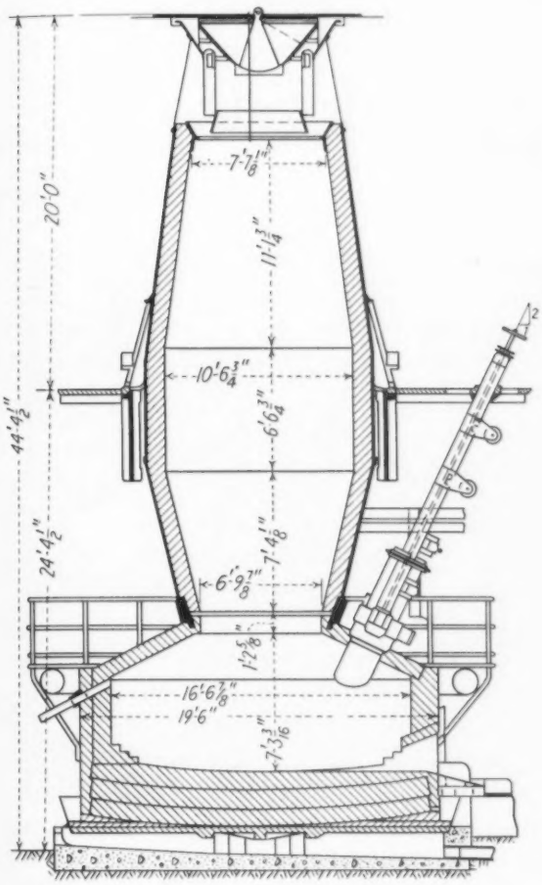
"L'Usine d'Aoste de la Societa Nazionale Cogna," *Journal Du Four Electrique Et Des Industries Electrochimiques,* March 5, 1938.

"Production of Pig Iron in Electric Furnace from Pyrite Sinter," by Giuseppe Ongaro, *La Chimica e L'Industria,* February, 1936.

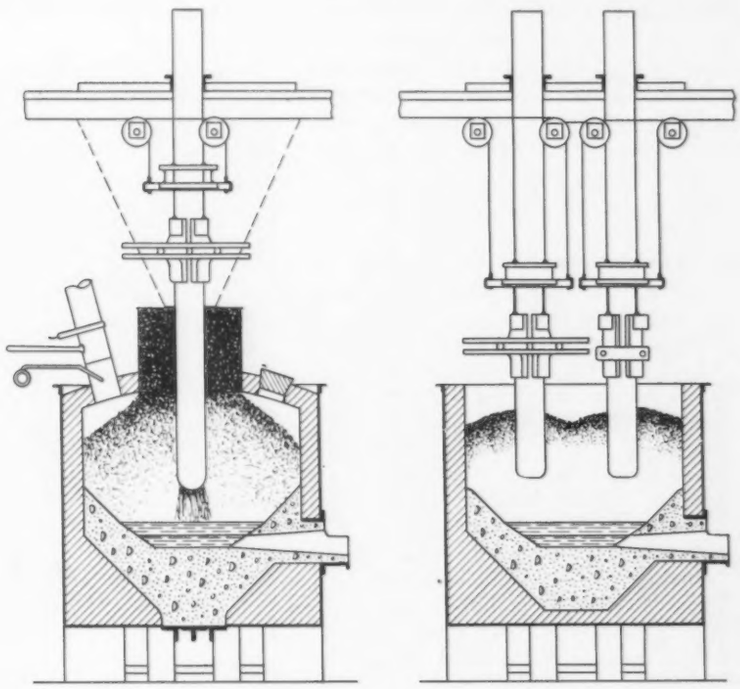
"Pig Iron Production with Electric Power," *Jernkontorets Annaler,* 1934, Vol. 2.

"Aufgaben des Lichtbogen-Reduktionsofens in der Eisen, Metallhutten and Chemischen Industrie, by M. Kauchtschischwili, *Siemens-Zeitschrift,* v. 17, 1937, No. 6.

have led to modifications in furnace design and in the last 10 years the Swedish so-called "shaft" furnace has been replaced in other countries by a pit furnace which is essentially a shallow brick-lined box into which the materials are charged from above. This type of furnace had previously been developed for ferroalloys and other electrometallurgical products, and its success led to the use for pig iron. The principal development has been in Norway where at Tysland, furnaces of this type have been in operation for several years. The sketches on this page show the construction of the Swedish shaft furnace and the pit furnace and illustrate the construction differences.[3]



(Left) Swedish shaft type electric furnace. (Right) Low shaft electric furnace developed at Tysland, Norway.



THE comparison between the material requirements of the conventional blast furnace used in the United States and the electric furnace used for pig iron production follows:

	Blast Furnace	Electric Furnace
Ore	Same	Same
Fuel	1800 lb.	800 lb.
Fluxes	800 lb.	400 lb.
Power	20 kwhr.	2500 kwhr.
Electrodes	..	25 lb.
Blast	3.5 tons	....
Surplus top gas available for extraneous use	25 to 30 per cent of heating value of coke, or 550 lb.	60 per cent or 480 lb.

This comparison shows that 1800 lb. of fuel and 3½ tons of air-blast have been replaced by 800 lb. of fuel and 2500 kw-hr. plus 25 lb. of electrodes. Without giving consideration to the limitations in the sizes of each type and the effect of size on labor per ton, a comparison of operating costs comes down principally to the difference between these two combinations of fuel, electrodes and power. (After all, the cost of blast is measured largely by the cost of the power to supply it.) The small difference in the flux requirements will have little effect on the iron cost because this is customarily a cheap raw material.

If the overhead costs and the cost of fluxes are neglected, electric pig iron involves a net consumption of 320 lb. of suitable fuel, 2500 kwhr. and 25 lb. of electrodes. The customary coke blast furnace requires for its operation 1250 lb. (1800 lb. less surplus gas equivalent) of good blast furnace coke and 3½ tons of air-blast. The surplus blast furnace gas is derived by deducting all blast furnace requirements (blowing, stoves, etc.), from the total top gas produced, in estimating the surplus available for power which appears in the preceding table. The cost of blast

[3] A. E. Greene, well-known and able Seattle electric furnace maker, is constructing a unit somewhat different from those used abroad. It is described as a tilting type, 3-phase multiple electrode unit, with closed top, through which the electrodes are suspended into the bath. Coal is to be used as a reducing agent. The furnace is equipped with an auxiliary rotary drying kiln into which ground ore, coal and flux is fed, dried and discharged directly through a closed feed-hole into one end of the furnace. Tapping of the slag and charge is at the opposite end. Gases, principally CO, pass out of the furnace countercurrent to the flow of ore, preheating and partially prereducing the ore as it drops from the kiln onto the furnace hearth.

per ton of pig iron in this comparison, therefore, reduces itself to the additional items of labor, repairs and supplies. For a furnace having a capacity of 1000 tons per day, blowing costs will not exceed 30c. per ton. The costs of the items for the two types of furnaces follow:

	Blast Furnace	Electric Furnace
Fuel @ $5 per ton	$4.50	$2.00
Electrodes @ 5c. per lb.	....	1.25
Fluxes	0.60	0.45
Blowing costs	0.30	....
Total	$5.40	$3.70
Surplus gas credit	0.93	0.62
Net cost	$4.47	$3.08
Power to equate costs	....	1.39
	$4.47	$4.47

Power per kwhr. permissible to equate costs = 0.55 mill.

This table shows that if coke can be had at $5 per net ton delivered to the furnace site the cost of *power for electric smelting cannot exceed 0.55 mill per kwhr.* A coke cost of $5 is not easily obtained at any point on the Pacific Coast. A more probable figure is about $6.50, which would make an equivalent cost of power 0.84 mill.

However, these figures wholly neglect the effect of the size of the furnace on labor, supplies, refractories, repairs and all of the other factors which enter into pig iron production.

Thus far the electric pig iron furnace has been restricted to relatively small sizes, and a furnace having a capacity of 12,000 kw. is a large unit, although bigger furnaces appear possible with the newer developments in furnaces of the Tysland type. A furnace having a capacity of 16,000 kw. operating with 90 per cent load factor could produce 50,000 tons of pig iron yearly. Such a furnace would likely cost about $350,000 in this country. A coke blast furnace having a capacity of 1000 tons daily could produce 330,000 tons per year, hence seven electric furnaces of the largest size would be required to replace one coke furnace of modern type. The coke furnace itself, including blowing equipment but exclusive of all ore-handling and stocking facilities, coke plant, etc., would cost perhaps $3,500,000, or $1,000,000 more than electric furnaces of the same annual capacity. Of course, it can be assumed that the ore-handling system and stocking facilities are about the same for an equal yearly output.

There is one very large factor in an electric smelting installation which greatly increases the investment cost. Seven furnaces, each have 16,000 kw. of transforming capacity, would represent a connected load of 112,000 kw. Irregularity of operation and diversity factors would reduce the average load to not more than 80,000 kw. To provide for peaks and spares a plant of 100,000 kw. would be required. Unless conditions are exceptionally favorable or not all of the cost is charged to power alone, such a plant would cost not less than $80 per kw. or $8,000,000 would need to be invested to furnish the power which such a plant would absorb.

Both plants would need a coke supply. The coke blast furnace would use 300,000 tons of coke annually, while an electric furnace would require only 135,000 tons. At 15 tons of coke per oven-day, the coke furnace would require 65 ovens and an electric furnace 25 ovens, a difference of 40 ovens or approximately $1,500,000 investment. The costs of the two coke plants would be $2,700,000 and $1,200,000. The total investments for the two types of plant for the items alone which have been considered in the preceding paragraphs follow:

	Blast Furnace	Electric Furnace
Furnace	$3,500,000	$2,450,000
Power plant	300,000	8,000,000
Coke plant	2,700,000	1,200,000
Total	$6,500,000	$11,650,000

The above comparison shows that investment in a purely electric smelting installation having the capacity to produce about 330,000 tons of pig iron yearly would be nearly twice as great as the investment needed for a single coke blast furnace rated at 1000 tons per day. Some items have been neglected in both cases and when these are added the comparison between the two plants will be slightly less favorable to a coke blast furnace, but nevertheless the latter is much less costly to build.

The comparison of production costs in an earlier table disclosed that with coke even at $6 per ton the power must be applied to the electric furnace at considerably less than one mill per kwhr. An investment cost for a hydroelectric installation amounting to $80 per kw. will represent about $100 per kw. of average yearly output for a plant most favorably situated and having a most favorable yearly load factor. With 8700 hr. of yearly operation an 8 per cent charge on this investment represents nearly one mill for capital expense alone. To this must be added operating expenses, investment in transmission lines, line maintenance and conversion and trasmission losses.

It is thus evident that power at one mill per kwhr. is not an obtainable figure with present day construction costs. All the investigation the writer has been able to make discloses that the lowest price *quoted by Federal agencies is 1.5 mills for power at Bonneville, where a considerable portion of the cost of the power installation has been charged to navigation. At Boulder Dam the Federal government has fixed a charge of 1.64 mills for falling water. The operating companies must pay in addition all operating expenses, amortize the cost of the installation in 50 years and transmit the power to a point of consumption. About 3 mills is a reasonable cost for the power delivered to Los Angeles.*

The preceding comparison of manufacturing costs, which led to the need for a power cost not exceeding one mill per kwhr. to enable the electric smelting plant to compete with a coke blast furnace, has neglected the differences in costs other than the few items which have been listed. Obviously, a group of seven small electric furnaces will require more labor, supplies and perhaps more repairs per ton than are required by one large blast furnace unit. In an estimate which was prepared by the army engineers for a suggested plant near Portland an allowance for labor of 4.89 man-hours per ton was made for five furnaces, each having a capacity of 5000 kw. For seven furnaces of the same size the requirements might fall to 4.75. If the furnaces were increased in size to 16,000 kw. the labor would fall to perhaps 1.75 man-hours per ton. A similar labor cost for a coke furnace of 1000-ton capacity would require 73 men per day or 24 men per shift, which is nearly twice the organization which a modern American furnace would need. This same report estimates the cost of basic pig iron at $20.80 per gross ton, or $18.60 per net ton. Of this cost $6.23 per net ton is attributed to ore, which so far as the writer has been able to determine is, say, almost $2 per ton of pig above the ore cost at points such as Birmingham and Provo. With this adjustment in the cost of ore the equivalent cost of basic pig iron becomes $16.60, which can be contrasted with

ONE modification of the Tysland-Hole furnace, a 7800-kva. unit with the electrodes in tandem. So far six furnaces of this type have been built, all in Italy near Milan. The burden is introduced through the shaft shown on each side.

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THE casting side of the tandem furnace shown above. Part of the current inlet arrangement, the water-cooling installation and the mechanism for charging may be seen. Below there is shown the furnace jacket, the lower part of which is cooled by water spraying, the casting runner, and part of the gas scrubbing arrangement.

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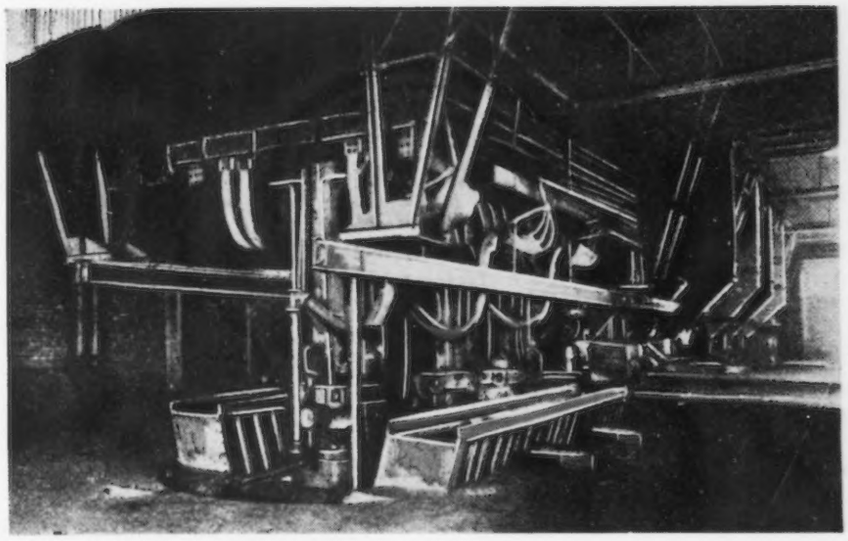

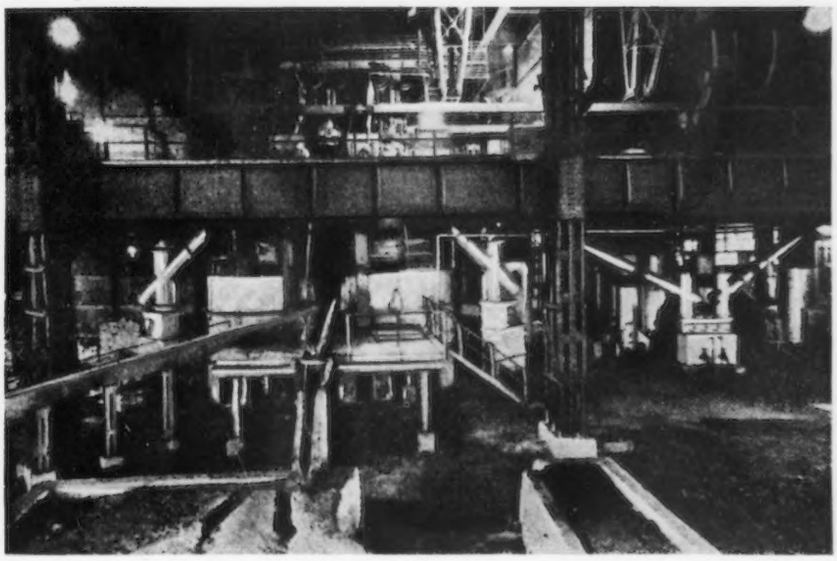

$10 or $12 at other centers using conventional blast furnace practice. In this estimate for Portland, power is charged at one mill per kwhr., which is less than cost.

Electric Manufacture of Steel

THE production of ingots from *scrap* in the electric furnace is a common operation and one with which all steel men are familiar. The process is simple, rapid and where power and scrap can both be had at moderate prices, the ingot costs are favorable compared with open-hearth furnace production.

For ordinary operation the customary power consumption is about 600 kwhr. per gross ton of production; but where specifications are simple, scrap is easily handled and the furnace has abundant power, the operation may be speeded and the power consumption reduced to between 400 and 450 kwhr. per ton. Under these conditions the conversion cost is favorable.

In the use of an electric furnace for steel making from *scrap* the operation is almost entirely re-melting with a minor amount of refining. The steel charge usually contains some dirt and oxide which must be slagged off but the slag volume is small, it is cheaply made and clean steel of high quality can be produced from a scrap of widely varying quality. The metallurgical conditions in the hearth are exceptionally good.

The production of steel from an *all pig iron charge*, or one nearly wholly made up of pig iron, in an electric furnace is a horse of a decidedly different color. In such a charge the metalloids, carbon, silicon, sulphur, phosphorus, and to a lesser extent manganese, must be removed from the pig iron to convert the latter into steel. This involves an oxidizing reaction which is only obtained rapidly through the use of iron ore or mill scale and the development of an oxidizing slag. Power is supplied to these steel furnaces through overhead electrodes made of carbonaceous material, either carbon or graphite, both of which are attacked by an oxidizing slag or by iron oxide charged on the hearth. The result is an excessive electrode consumption, and a large slag volume reduces speed of operation. Thus, there is an inevitable increase in cost. Only in rare instances where this operation cannot be avoided is steel made in an electric furnace from a charge consisting largely or wholly of pig iron. Where the electric furnace is used for pig production, as in Sweden, the pig is made into steel either in Bessemer converters or in open-hearth furnaces.

Raw Materials on the Pacific Coast

ALL this recent publicity concerning the expansion of the steel industry on the Pacific Coast has revolved around the idea that there are abundant supplies of ferruginous materials but that the fuel supply is scant. The proposal has appeared that fuel could be replaced by power and the Federal projects at Grand Coulee, Bonneville and Boulder Dam could supply sufficient quantities at suitable costs. The map opposite page 26 shows the locations of the principal iron ore supplies from the Rocky Mountains west to the Pacific Coast. Prospectors have literally tramped grooves over these deposits, and there are reports available on all of them and on many more of lesser importance, both for surface prospecting and

underground drilling. The largest deposit is probably the one at Eagle Mountain in Riverside County, Southern California. This is owned by the Southern Pacific Railroad and the Government reports indicate reserves of more than 50,000,000 tons. In this particular instance the prospecting work has been meager and practically no deep work has been done. The other deposits range in size from 2,000,000 or 3,000,000 tons to perhaps 20,000,000 tons, with deposits of the last size rare, however. Most of the other deposits indicated are small and unimportant or almost wholly inaccessible, as in the case of Minarets deposit which lies high in the Sierras at an elevation of more than 10,000 feet.

Almost all of the iron ores of the Western States are of the same type and have the same geological history. They are the results of the weathering of a deposit originally consisting largely of pyrite—iron sulphide—and the sulphur content today depends upon the extent to which the original sulphur has been removed by weathering. The Provo, Utah, deposits are about best in the west in that the sulphur has been thoroughly leached, the iron has been concentrated and the ore now is all good commercial grade. Farther west the great majority of the ores have not been so fully weathered, either because the geology is younger or the weather conditions less favorable, consequently almost all of these deposits show considerable sulphur wherever the prospecting has been carried to sufficient depth to reach any considerable distance below the surface. From all reports available this is almost invariably true. Not only is the sulphur high but it is irregular, and this irregularity is always a troublesome factor in operation.

There are many reports of iron deposits in California, Nevada and Arizona which are said to carry about 70 per cent iron. However, past history in that entire area has shown without exception that deeper prospecting discloses an iron content of about 55 to 56 per cent, which would be all that could be maintained in regular mining operations. It is true that this is one-tenth higher than the iron in the eastern Lake Superior ores, but the latter are low in sulphur while the western ores require roasting at a probable cost of over $2 per ton of pig iron, or possibly in a few cases they can sometime in the future be used (as this technique is perfected) to produce pig iron refined by chemical treatment in the ladle at a cost of 50c. to 60c. per ton.

To abbreviate all this discussion, therefore, the iron ore situation on the Pacific Coast is not attractive and does not indicate the possibility of any large-scale development.

The Pacific Coast states have almost no deposits of coking coal. Arizona, California, Nevada, Idaho and Oregon have none whatever. In Washington there are a few small deposits near Tacoma, where a dirty coal is available which will make a strong coke after washing. In Utah a small area around the Columbia mines and for perhaps 50 miles south thereof produces a coal which will make a weak coke. In northern New Mexico, southwestern Colorado and in south central Colorado there are coking coals of fair quality. In Canada there are some coking coals on Vancouver Island, on the mainland near the coast about 100 miles north of Vancouver, and at Crows Nest Pass north of Butte. The coals on Vancouver Island and at Crows Nest Pass make fair coke.

This brief description of the coal resources indicates that there is no supply close to the iron ore resources, except in Utah, and that the cost of assembling iron and coal at one point must inevitably be high.

The Federal Administration apparently believes electric power can so greatly reduce the amount of fuel required for the steel industry and that power can be had so cheaply from the Federal projects that the high cost of fuel will not be a serious handicap. The writer raises his weak voice herein that this analysis should be subjected to considerable modification. Even with electric power, there is required a considerable quantity of coking coal or timber (sawdust has been suggested!) for charcoal. The latter appears out of the question for a big project and only in the vicinity of Tacoma and Seattle can coal be had which will be close enough to a power supply to be usable. The Federal Government itself has made several reports and estimates of pig iron production and in one dated March, 1936, coke has been estimated to cost between $5 and $6 per ton, which is about the figure used in the earlier cost comparisons. This is the cost for Portland where Bonneville power can be had at low cost. Any other location except near the coal fields will give higher coke costs.

The preceding description of the iron ore and coal supplies indicates that there seem to be no opportunities for the production of pig iron and steel through the use of electric power at costs which can be considered cheap compared with existing competitive operations on the Coast. There are no ores which are suitable for the Bessemer process, either acid or basic, although one small deposit near Portland has a fairly high phosphorus content and would make a pig iron approaching the grade required for the basic Bessemer process. However, the phosphorus in this ore is somewhat lower than is desirable. The electric furnace might be used for making pig iron but the open-hearth furnace should be used for steel, and in such an operation the pig iron immediately comes into competition with cheap scrap.

Expansion of Pacific Coast Production

CERTAINLY the blast furnace as an economical producer of pig iron is far from licked yet, according to the data herein. Furthermore, all industrial history and good sense would indicate that iron and steel production should be centered at a point where assembly cost of raw materials is at a minimum.

Where then should an additional Pacific Coast steel industry be established? That is, if the Government is so darn hot to have one established for commercial reasons or for national defense. To the author's mind, at least, the map opposite page 26 supplies the answer—Utah!

It would appear that a steel plant near raw materials in Utah would be able to deliver its production to all points on the Pacific Coast at uniform freight rates and at delivered costs that would be quite low. If military strategy is the issue, then a Utah steel-making center would be far enough from the seacoast to be free from any probable attack by hostile planes. Navy or Army materials could be supplied within 24 hr. and could move with equal facility to every one of the Pacific Coast ports. The raw materials in Utah are ample for a century of operation, and the Pacific Coast market requires enough steel to support a fully integrated and diversified steel-making plant. But of course a Utah plant would displace existing capacity and workmen at Sparrows Point, Birmingham and other sections of the country, and the displacement necessarily would be *predicated on some basis other than free and open competition—because many types of steel can be made at existing plants and shipped by water to the Pacific Coast more cheaply than a new Utah plant could make steel from pig iron (little scrap available) and ship by rail.* Another difficulty with the suggestion is that Utah ore production would necessarily be based on conventional blast furnace practice, which would constitute little relief to the carking complications of Federal power disposal.

WELDING ALUMINUM AIRCRAFT ALLOYS

By MARIO SCIAKY
Chief Engineer, Société Anonyme Sciaky

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INTENSIVE production of military aircraft imposed upon European countries in recent years in order to keep up with the rapid strides made by Germany in aircraft production since the rise of the Hitler regime has imposed in its turn research for dependable, economical and rapid methods of production. Most of the European plane manufacturers have adopted American methods of stamping and forming light alloys because such methods have proved to be the best. On the other hand, European methods of fabricating these stampings into a completed ship have been ahead of those used in the United States.

In France, England and Italy, electric resistance welding of aluminum alloy sheets is widely used not only in the fabrication of secondary structures and non-stressed parts but also for such vital components as wing ribs, flaps and stiffeners for wing coverings. In one Italian plant, for example, three-fourths of the assemblies found in certain plane models are fabricated by means of electric spot welding. In the United States, welding up until now has been largely limited to the secondary structures and the much more costly method of riveting has been followed on the primary structures. This situation was due primarily to the difficulty of obtaining satisfactory welds in alumi-

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SCIAKY type PMCO 2S electric resistance spot welding machine in operation at the plant of the Douglas Aircraft Co., Santa Monica, Cal.

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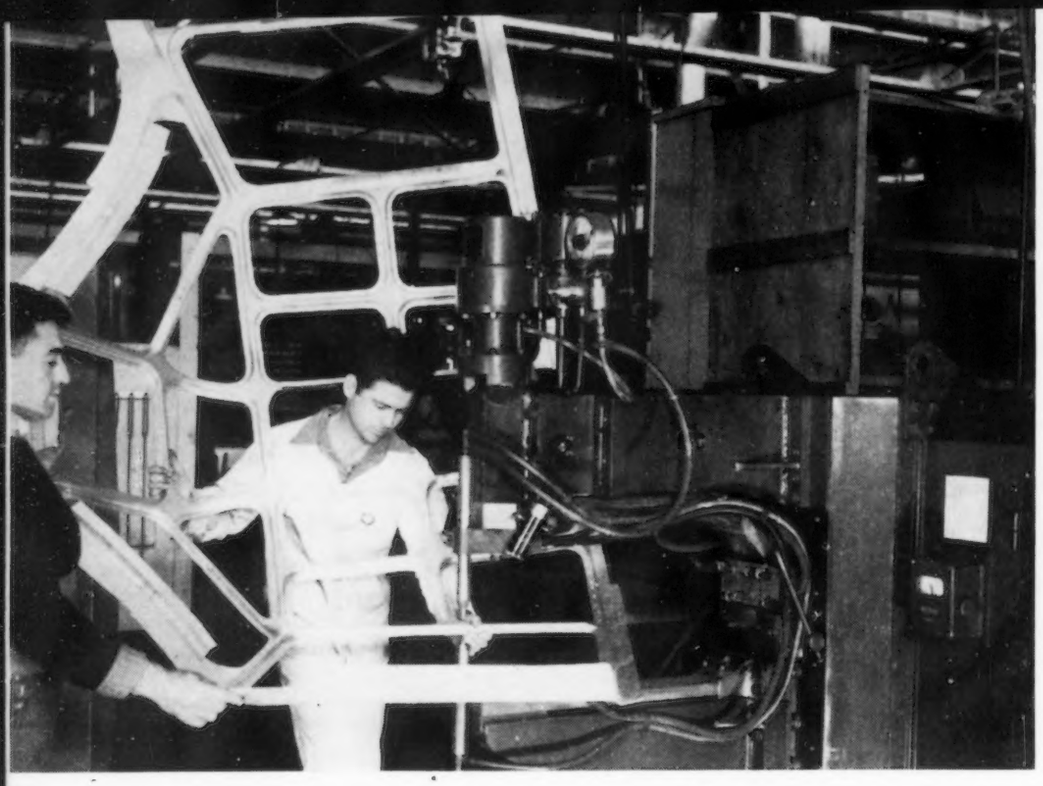

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STRUCTURAL frame member of aluminum alloy being spot welded at the Consolidated Aircraft Corp. plant at San Diego, Cal., on one of the new Sciaky machines.

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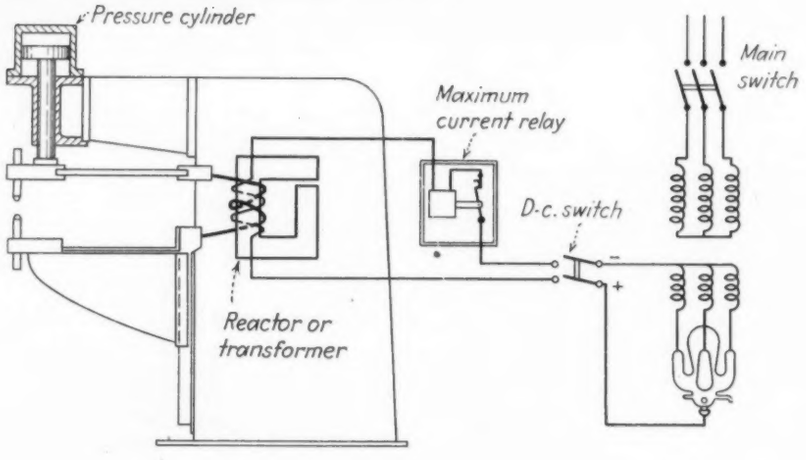
BELOW

DIAGRAM illustrating the accumulation or storage of energy principle of the Sciaky type PMCO 2S electric resistance welder. The reactor is charged with electromagnetic energy from the three-phase mercury arc rectifier. The differential pressure cylinder for the upper electrode is pictured at the upper right.



num alloy sheets when using conventional spot welding equipment.

In recent months, however, one of the resistance welding methods so widely used abroad has been adopted by aircraft manufacturers in the United States. This article will briefly describe the system of electric resistance welding developed by the French-English Sciaky company of Paris, France, which has set up an American branch to manufacture machines at Chicago. In the short space of three months, practically all the leading aircraft manufacturers have purchased one or more of these machines, and in the same period the Sciaky machine has been tested by the Southern California Edison Co. at Santa Monica, Cal., as well as by the Philadelphia Navy Yard. Satisfactory results are reported from all these plants.

Stored Energy Principle

Two principles form the basis of operation of this type of welding machine: That of stored energy and that of a variable pressure cycle. The principle of stored energy consists in accumulating a certain quantity of electrical energy under electromagnetic form in an iron core reactor or transformer during an appreciable period of time and discharging that energy in a much briefer time.

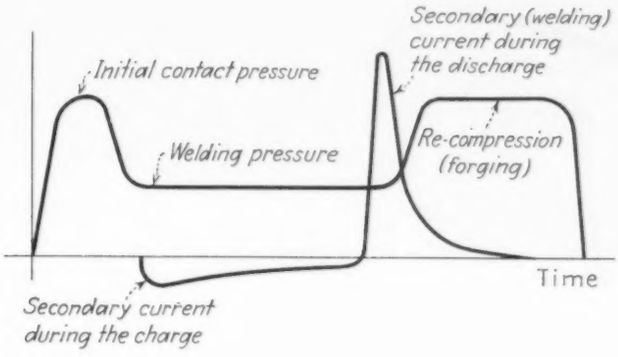
For example, if the energy is stored up in the reactor in 0.1 sec. and is discharged in the welding circuit in 0.01 sec. or 10 times shorter, the instantaneous power available in the welding circuit is ten times stronger, less losses in the reactor and secondary circuit. This principle permits then in having charged during 0.1 sec. a power of 40 kva. and to discharge in the secondary circuit a power of 350 kva. (87½ per cent efficiency) in 0.01 sec. Hence the builder's claim is justified that such a machine will do the same work with 40 kva. that a conventional 350-kva. machine will do, omitting for the moment any considerations of quality of weld:

The power accumulated in the reactor is supplied by direct current, but the machine as a whole is hooked up to an ordinary three-phase a.c. power line. Rectification of the current is obtained by means of a mercury vapor arc rectifier connected, as can be seen in the circuit diagram, with a star transformer, three phase. The cathode of the rectifier and the neutral point of the star transformer supply the direct current. This arrangement gives the further advantage of balancing the three phases of the power circuit, and consequently the machine of 40 kva. capacity, compared to the conventional single-phase hook-up, takes on a phase power of 40 kva. divided by $\sqrt{3}$.

This is obviously very small power for welding of light alloys, which ordinarily require considerable power because of their high conductivity, and one can understand the interest of the Southern California Edison Co. in a machine of this type, because it eliminates disturbances to the lines in the region of Los Angeles where a large part of the aircraft industry is located.

The direct current from the rectifier charges the reactor through a maximum energy relay which is set to operate when a predetermined amount of energy is stored up in the iron core of the reactor. At that point the main d. c. switch is tripped, and it is the decaying flux in the reactor that sets up the high transient welding current. The welding current reaches its peak value instantly and decreases following an exponential curve in relation to time in overcom-

ing the resistance of the secondary circuit. The building up of energy in the core follows the same exponential law, there being for any value of current a definite quantity of energy stored in the magnetic circuit. The current in the primary before the contact is opened is governed, therefore, by an adjustable current operated relay, having a dial gage reading directly in amperes. The amount selected depends upon the thickness of the sheets to be welded. The time constant of the circuit comprising the magnetically charged core and the secondary circuit is governed by inserting additional resistance in the secondary circuit, thereby using up some of the energy and shortening the time of current flow. It is obvious that the welding current is independent of any fluctuations in the supply voltage, and that no bump occurs on the line when the weld is actually made, since at that instant the primary circuit is open.



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RELATION of pressure at the electrodes to current as a function of time. A small preheating current is induced in the secondary circuit of the reactor while it is being charged. Welding current rises to a peak almost instantly following tripping of the charging contactor.

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BELOW

SPOT welding a fuel tank of Alclad 24S-T duralumin on a Sciaky machine recently installed at the Consolidated Aircraft plant.

Variable Pressure Cycle

The second principle of the Sciaky machine is the use of a variable pressure cycle. As the diagrammatic sketch of the welding circuit indicates, pressure at the electrodes is obtained by a differential air cylinder. A curve is also reproduced showing the relation of the variable pressure cycle to the welding current throughout the cycle. Initially a high pressure is applied to establish perfect contact between the sheets before passing the welding current and to prevent "blowing up" of electrodes resulting from poor contacts. The pressure is then decreased an instant before current passes so as to obtain maximum contact resistance and hence maximum heat during welding. Immediately after passage of the current, the pressure is increased to its former high value with the idea of working the metal to compensate for the changes caused by the temperature rise. This pressure cycle is effected automatically through electro-pneumatic valves which admit air under pressure to the bottom side of the piston (piston area less area of the rod) during the low pressure part of the cycle, full pressure remaining on the top of the piston during this period. The time intervals of the variable pressure cycle are determined by rheostats acting on static time lags, selection being made by push buttons on the side of the machine.

During this same low pressure period, the charging of the reactor causes a low current to flow in the secondary and this serves as a preheating current. When the charge of the reactor is finished and the discharge effects the weld, the pressure is brought up and squeezing of the hot metal is done in such a way as to re-impart to the welded material the initial characteristics, which ordinarily are materially lessened by the heating of the pieces. As the pressure-current curves indicate, the discharge does not stop suddenly and the high pressure is maintained during the progressive decreasing of the current, which maintains the heat during the forging.

The variable pressure system is located on the top arm of the machine, and upward and downward movement of the upper electrode is by the air cylinder mentioned and a prismatic slide, fitted on a roller bearing to reduce friction. Controls are incorporated that prevent flow of the welding current unless there is effective contact between the electrodes and the work pieces and unless the pressure is correctly established an instant before welding. The machine can be operated either with or without the variable pressure feature, which is not needed when welding stainless steel. The machine is adaptable for portable welding guns provided kickless cables are used. Seam welders have also been made, operating on the same principle. Straight-copper electrodes are fully satisfactory on a machine of this type.

Perfect consistency of welds is claimed for this machine and the welds are free from cracks. Perhaps the best answer to the question of weld consistency is to state that the airplanes that are now in action in Europe have tens of thousands of spot welds made with this type of machine —many of these welds on vitally stressed parts.

What Plastic to Use

IN considering the use of a plastic for a particular article, the engineer is usually faced with a mass of data which is highly confusing and results in difficulty in selecting the proper type of plastic. Data have recently been prepared by C. W. Blount, of the Bakelite Corp., so arranged as to assist in determining which plastic will suit a particular need best.

Plastics are divided into two groups:

(I) Those which soften when heated and harden when cooled. They can be reheated to soften and recooled to set almost indefinitely. Such products are permanently thermoplastic, and are called "thermoplastic materials." The following are samples of this class: Shellac, cellulose acetate, ethyl cellulose, methyl methacrylate, polystyrene.

(II) Products which in molding can be softened by heat and on continuous application of heat freeze, after which they cannot be softened sufficiently again to reform or reshape. These are known as the "thermosetting materials." Such products are phenolics, those obtained by combining phenol and formaldehyde; ureas, those obtained by combining urea and formaldehyde.

The best known plastic molding materials and those which enjoy a wide use in the plastics industry are: Phenolics, ureas, cellulose acetates, polystyrene.

Instead of considering these materials by property, it is more instructive to consider the properties by material. The results obtained are shown in the accompanying table, which might be called a "consumption table."

It would be desirable, for simplification, to consider each group of materials by taking the best property of any one group. Unfortunately there are a variety of materials produced in each class. For example, all cellulose acetate is not the same. The highest tensile strength material is the least flexible; the most flexible has the lowest tensile strength. So, in considering acetates, it is necessary to take what may be termed an average optimistic value of what can be obtained with one acetate material or another.

The range of phenolic materials that is available is so wide that it is necessary to specifically divide them into four divisions. By no means do these divisions cover the properties of all the phenolic materials. There are products that come in between. However, with the four ranges considered, enough data are available for the purpose of the table.

The table shows the relative toughness of the various plastics. Also, the relative flexural strengths are shown, the materials being rated from highest to lowest from 1 upward. The same thing is done for tensile strength. Please note that cellulose acetate, which is highly shock resistant with a rating of 1, rates only 4 in tensile strength.

The greatest error made by engineers when dealing with plastics is to ask for a material of a higher tensile strength when what they really mean is that they wish a material that is tougher, or has higher impact strength. For example, not so long ago a manufacturer of heater plugs wished a stronger material and asked for one of higher tensile strength. Investigation showed that he wished to meet the Fire Underwriters' specification which involved a multiple dropping of the assembled plug against a maple board. The man really wanted a material of higher impact strength.

Now note the color designation in the table. The materials are rated from 1 to 3. All shades are possible for 1 and 2, but for the phenolics darker shades are recommended.

The materials are simply rated in numerical order as regards cold flow. Why is cold flow a problem? Here is an example: A manufacturer is assembling a molded plastics part and a metal part with a hollow rivet. He sets up a pressure on the rivet. If the material flows under strain, as cellulose acetate does, the assembly will become loose. However, if the material remains rigid as phenolic general purpose material does, the assembly will remain intact. When considering riveting only, any material rated 6 or better should be satisfactory. However, there are other problems involving this movement, besides riveting, where the differences from 6 to 1 may be of consequence.

The chart on heat resistance indicates the relative temperature at which the plastic materials can be used continuously without serious effect on their properties. It is necessary to stress the word "continuously" for urea on the chart is rated below acetate. But, if hot coffee were to be poured into a cup made of acetate it would soften immediately, whereas urea would remain satisfactory.

Flammability is rated numerically from 1 to 6. This rating is arrived at by holding a specimen in the cone of a Bunsen burner flame for one minute, removing it and recording the length of time required for the flame to go out.

Recently there has been much consideration of plastics in refrigerators. Therefore, relative heat insulation characteristics are of interest. The barographs illustrate the relative thermal conductivity of the various materials. Frankly, none of the plastic

materials would be satisfactory for heat insulation on uses such as the inside lining insulation for refrigerations, which is mineral wool or a similar material. Their use is principally for breaker strips which separate the outside surface of the metal door from the inside surface of the metal door. The plastics illustrated are poor conductors of heat. For example, even with the material of highest thermal conductivity it is possible to carbonize one side of a piece and still be able to touch the other side.

The table also rates chemical resistance and water resistance. Relative acid and solvent resistance are shown by rating the materials from best (1) to worst. Relative caustic resistance is also shown by rating from best to worst. Dimensional change after molding is shown in the same way. It might be well to explain what is meant by "dimensional change after molding." Most plastics shrink on removal from the mold and on cooling from 0.002 to 0.012 in. per in. The rating refers to that change in dimension that takes place after molding. For instance, in the humid summer a top will fit on a phenolic box and can be removed with ease. In the winter time in a steam-heated atmosphere a urea top will shrink on a phenolic base so much as to cause binding and even breakage on the phenolic base. There is also a natural tendency, under even ideal humidity and temperature conditions, for one type plastic to shrink more than another type.

Lightness of weight is often the reason a plastic is considered for a given application, such as storage battery cases for aircraft and outlet boxes for 10,000-ton Navy cruisers. The relative specific gravities are rated in the usual fashion from the best (1) upward.

Frequently a plastic as hard as glass is desired. There are no plastics as hard as glass. The hardness in the table is rated numerically from hardest to softest. Materials can be produced that are appreciably harder than the phenolic heat resistant type. For extreme hardness, special materials can be obtained.

The electrical insulation properties of materials are also considered. The first thing of interest, since most current is alternating or intermittent, is the power that is absorbed by insulation in performing its function. This is termed "loss factor." In the table the best material is considered as having a loss factor of 1. The phenolic general purpose, which has been very satisfactory for thousands of uses for 60 cycles, 110 to 440 volt power, has 10,000 times the loss factor of polystyrene. Loss factor becomes serious as the frequency increases. The table covers only to one million cycles. One recent specification set by radio engineers for insulation on short wave transmitting equipment required that an insulating material placed in the field of the transmitter, at 30 million cycles, heat up not more than 10 deg. F. above room temperature. Polystyrene is the only plastic which has a chance of meeting that requirement.

Next in importance is resistivity. This relates principally to direct current use. All the materials shown have been satisfactory on direct current applications. Again polystyrene is considerably better than phenolic general purpose with which most of us are familiar. The ratio is surprisingly 10 million to 9.

Dielectric strength is a property which has been given more consideration than any other. The test is made under controlled conditions at 60 cycles. Many parts are designed and plastics used for them considering only this one property. This is not enough, for the dielectric strength of all the materials is affected adversely by heat. Hence, if the loss factor is such as to cause heating, and alternating, or intermittent, current is involved, the dielectric strength will be correspondingly reduced. Several years ago the problem of a molded spool was encountered. The specifications required that the walls withstand 22,000 volts electrical pressure for a given period of time. Failure occurred. It was necessary to make material of better and better dielectric strength. Finally, with a general purpose type material, a product was produced with dielectric strength of over 500 volts per mil on an A.S.T.M. test piece. Still failure occurred. Loss factor was then considered. A product of a low loss factor was produced and then a material used with a

PLASTIC MATERIAL	Toughness (Impact Strength)	Flexural Strength	Tensile Strength	Color	Cold Flow	Water Resistance	Acid Resistance	Caustic Resistance	Solvent Resistance	Dimensional Change on Aging	Heat Resistance	Flammability	Heat Insulation (Thermal Conductivity)	Weight per Unit Volume (Specific Gr.)	Hardness	Loss Factor (Range of Frequencies)	Resistivity	Dielectric Strength	Moldability Around Inserts
Phenolic: General Purpose	6	3	2	3	4	5	3	3	1	4	2	3	3	3	5	5	6	4	1
Phenolic: Low-Loss	3	3	3	3	2	2	3	3	1	2	3	1	6	6	2	2	2	3	1
Phenolic: Heat-Resistant	7	4	7	3	1	2	4	3	1	1	1	1	6	7	1	○	7	5	1
Phenolic: Acid & Alkali Resistant	8	5	5	3	6	3	2	2	1	5	3	2	2	2	4	○	3	4	2
Phenolic: Shock-Resistant	2	2	4	3	5	6	4	4	1	6	3	4	2	4	5	○	8	5	1
Urea	5	1	1	1	3	4	4	3	1	7	6	5	5	5	3	4	4	1	3
Polystyrene	4	5	6	2	7	1	1	1	2	3	4	6	1	1	6	1	1	2	5
Cellulose-Acetate	1	5	4	2	8	7	4	4	3	8	5	6	4	3	7	3	5	4	4

dielectric strength of only 350 volts per mil successfully. Dielectric strength is also affected adversely as the thickness of the piece is increased.

All the properties of plastics are not considered in the table, but those given with ratings from best to worst are the essential ones that the user of plastics comes in contact with most frequently from day to day.

There is also a column, "Moldability Around Inserts." This refers to the ability to mold a metal insert into plastics, anchor it firmly, and retain it without the wall of the molded plastic cracking. The table looks very nice but perhaps it is too complicated. How can it be used? First, consider known successful applications of plastics.

The distributor head of an automobile involves insulation and conductance. Phenolic general purpose material has been used satisfactorily for a number of years on this part. The requirement of an automobile distributor head is moldability around inserts. Referring to the table, there are four materials rated in the No. 1 position. The next property desired is insulation. So, consider the column headed "Loss Factor." Why? The current that gives the spark on the plug is intermittent and, therefore, loss factor is important. On considering this column, two of the four materials may be disregarded, and phenolic general purpose and phenolic low loss materials are obvious choices. Proceeding to chemical resistance, phenolic low loss material is best suited. Then on considering strength, the phenolic low loss still looks best. For resistivity and dielectric strength, it is still best. As a matter of fact it is best. One of the large automotive companies has recently advised that this material is the most perfect insulation it has yet tried on its ignition parts. However, there is another factor to consider—that of cost. The general purpose is cheaper not only by the pound but lower in specific gravity as indicated by the table and can be more readily molded, so that accounts for its practically universal use.

Consider next a fountain pen barrel as a housing only, and also a fountain pen cap. The primary thing wanted is toughness. Cellulose acetate is No. 1. Look next at the column "Color." Cellulose acetate is No. 2. The fountain pen must not freeze when the two parts are screwed together, so dimensional change on aging is important, and a red flag appears—No. 8. Then go backward. Consider the second toughest material. Phenolic shock resistant. But it is poor on color. So then investigate what happens on dimensional change and take into consideration the dimension of the part involved and the decision is to try cellulose acetate. Actually it is used and quite satisfactorily. However, there is another requirement. On recent production of fountain pens the wish is to make a plunger type where the barrel comes in direct contact with the ink. So, chemical resistance is involved. Therefore, after consulting the tables the manufacturers are experimenting with polystyrene which is rated either No. 1 or No. 2 for water, acid, caustic and solvent resistance.

Thus far only a reference has been made to the all-important element of cost in a general way in using the table. When the cost of a specific part is considered, many factors are involved. For example, A wishes to purchase 10,000 parts. He determines that cellulose acetate or phenolic general purpose would suit his needs. Which would be cheaper? If he states that he will purchase the 10,000 and all is over, the problem is simple, for, in general, molds for cellulose acetate parts are roughly 40 per cent of the cost of molds for phenolics. This would also be true of molds for using polystyrene. On the other hand if customer B desired 5,000,000 bottle caps, the excess in mold cost is made up in saving in material cost and he may well choose either phenolic or urea, for the material is sold by the pound and there is a considerable saving in raw material.

Parts produced of phenolic general purpose materials are cheaper than those produced of urea. So the question of cost may be classified as follows:

Thermoplastic materials — Polystyrene is more expensive by the pound or cubic inch than cellulose acetate, but in at least some instances production increase, using the polystyrene, has offset the differential in material cost.

Compression — Phenolic, general purpose is No. 1 in low cost. Phenolic heat resistant No. 2; urea No. 3; phenolic low loss No. 4; phenolic acid and alkali resistant No. 5 and phenolic impact resistant No. 6.

The next step is to consider proper design. Can a given part of given design be molded? The answer is generally "Yes, regardless of design." For example, a steel ball can be molded in a hollow sphere of plastic. It can be rattled and the accomplishment can be observed in awe. However, there is another question which follows immediately. Can the product be produced economically or can it be designed so it can be produced economically, and what steps are necessary? The answer to this question is difficult.

The first consideration for economic production is that a part must be removed from the mold. Hence, avoid undercuts or side holes. The piece must draw freely and readily from the mold. It is inadvisable to allow less than 1 deg., and preferably 3 deg. draft, on a molded part.

The next point to consider is the parting line or lines. In spite of literature that states plastic parts come from the mold requiring no further finishing, such is not the case. Now if a handle is of hexagonal shape, the piece can be parted at corners of the hexagon and the finishing problem is greatly simplified. This is a single illustration where only one parting line is involved. On complex assemblies this problem is multiplied.

Sharp corners should be avoided wherever possible. Also, a part should be of uniform wall thickness. Sharp corners on inserts increase the tendency to crack. A round insert is often used, there being sufficient wall thickness to eliminate cracking difficulty.

It is often desirable to mold letters or decorations in the plastic pieces.

If the letters are raised on the molded piece, it is only necessary to engrave them in the mold, whereas if they are sunk in the molded piece it is necessary to remove all of the steel from the mold excepting where the letter is to show.

The following "don'ts" are also well to consider in designing plastic parts for economical production. Don't call for holes or inserts that require long, slender core pins to hold them in place during the molding operation. Bear in mind that the plastic flows under pressure from 2000 to 6500 lb. per sq. in. and these pins will break if they are too long or too small in diameter.

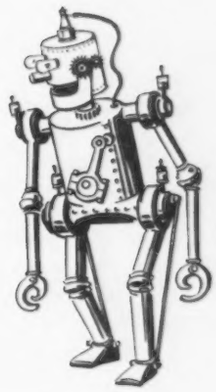
Don't design parts with re-entrant curves or undercuts.

Don't call for blind holes or inserts in the sides of pieces where the depth of the hole or the length of the insert is greater than twice its breadth.

Don't call for unnecessarily close tolerances.

Don't design pieces so that an electric arc will come in direct contact with the molded surface.

White Rabbit or Robot



1940 MODEL

Editor's Note:

ON the 11th of March, Senator Joseph C. O'Mahoney of Wyoming, chairman of the Temporary National Economic Committee, rose in the Senate of the United States and offered a bill. In introducing it, the Senator said, in part:

"The bill which I am introducing is designed to make it profitable for every employer of labor to use the largest possible number of workers. It is made self-supporting by a system of tax credits and contributions computed on the basis of the present income tax structure.

"Rewards, in the form of tax reductions or even wage subsidies, are held out not only to those who create new opportunities for employment, but, indeed, to all employers of labor, and the program would be financed, not by government borrowing, but by a 'labor differential tax' to be assessed against profits which arise as a result of factors by which labor costs are disproportionately reduced.

"The measure is intended to effect an alliance between men and machines that would insure the maximum use of both. It is based upon the fundamental concept that there can be no permanent prosperity even for the most highly mechanized industry unless the masses of the people are able to buy the products of the machine.

"It rewards the employer of labor by giving him a tax credit based upon the amount of wages paid. Every employer would receive this credit and it would become a cash payment when the employer's wage account was sufficiently large in proportion to the mark-up of the goods or services produced.

"On the other hand, however, in cases where the mark-up, that is to say, the difference between gross income and costs is excessively large as compared with total wage payments, a tax would be paid by the employer.

"The bill here offered is drafted in tentative form, but contains, I believe, the formula for the long-awaited permanent cure of unemployment. I ask that it may be printed in full in the Record so that it may be available for criticism to all who are interested in incentive taxation."

Senator O'Mahoney's bill is reproduced as a part of this article, together with liberal extracts from an article in the *Journal of Electrical Workers and Operators*, by Karl Karsten, on which the bill is based.

This proposal should be studied carefully by every IRON AGE reader, because of the prominence and sincerity of its sponsor, because of the apparent interest of other legislators, as expressed in the discussion of it at the time of its introduction and because of public concern over unemployment and its relation to the machine.

Mechanized industry, as the Senator has observed, has a large stake in the preservation and building up of national consuming power, because modern mass production depends for existence on the buying power of our masses. And it is only because industry, as a whole, has been indifferent to its obligation of interpreting itself and the machine to the public, that we can have such prominent statesmen propose, seriously, such a strabismic conception of remedial legislation.

Time forbids the presentation of a critical analysis of this plan in this issue. It will be dealt with thoroughly in our next. (J. H. V. D.)

"THE Daggett Proposal is offered as the American way to end unemployment. * * *

"What is the Daggett Proposal?

"It is a proposal for an American national policy of 'Job Protection.'

"It is called 'job protection' because it 'protects' the labor market in the same way that we 'protect' other markets—in this case by an internal protective tariff wall that will make it easier for the purchaser of energy to employ man power.

"It is called the 'Daggett Proposal' in order to honor a great educator of

the Revolutionary War period who gave his life to help establish the principles of democracy on this continent.

* * *

"To understand the Daggett Proposal it is only necessary to understand one very simple fact—the fact that 'differential payments' can be used to cure unemployment.

"The number of jobs changes with changes in the demand for labor. Jobs get more plentiful when that demand rises and get more scarce when it falls. The way to increase the number of jobs is to increase the demand for labor.

* * *

"The demand for labor rises with each decline in the real cost of labor compared with the cost of using substitutes for labor. And, vice versa, it falls with each rise in cost.

"Employers can give employment when they find it economically sound and profitable to do so. They cannot be expected to give employment when they find it uneconomic and unprofitable to do so, or when they find it more profitable to use substitutes for labor.

"The real cost of labor, compared to the cost of using substitutes for labor, is generally the deciding factor in determining whether to use man-power or a substitute, or if no substitute is available, whether or not the job can be done at all.

"Without debasing wages in the least, labor costs can be reduced for the employer by the simple device of having someone else make up the difference. Though the employer pays the same wage rates, his labor costs are reduced by the amount of such 'differential payments.'

"Who ought to make up the difference? When the government and the public get weary of relief loads and want more jobs to be given in private employment, will it not become logical and proper for the government to make up the difference to the employer?

"Collections" and "Handouts"

"The Daggett Proposal therefore proposes that the government give to each and every private employer of labor in the United States a 'differential payment' consisting of a small uniform percentage of his payrolls during the year.

"This percentage shall be fixed by Congress during the previous year in order that every employer can count upon it when deciding his employment policies.

"This percentage shall be just great enough to influence in the desired way the employment policies of the average employer and increase in the desired way the number of jobs.

"To understand the great savings made by the Daggett Proposal as compared with the cost of emergency relief, it is necessary to understand how 'differential collections' can be used to 'off-set' and cancel out most of the 'differential payments' and to finance the small remaining payments.

"What are 'differential collections'?

"'Differential collections' are simply a 'pay-as-you-go' method of financing the cost of 'differential payments.'

"Under the Daggett Proposal the cost of distributing 'differential payments' to end unemployment is to be met by contributions from all producers pro rata in accordance with their contributions to the national total of goods and services produced in the nation. This is only fair.

"Every producer will necessarily pass the cost of this contribution on to the consumer. Therefore the cost will in the end be borne by the consumers pro rata in proportion to their parts in the national consumption. This is also fair.

"In the Daggett Proposal these contributions are called 'differential collections.'

"So stated, the 'differential collections' made to finance the 'differential payments' are not discriminatory and

76TH CONGRESS
3D SESSION

S. 3560

IN THE SENATE OF THE UNITED STATES

MARCH 11 (legislative day, MARCH 4), 1940

Mr. O'MAHONEY introduced the following bill; which was read twice and ordered to lie on the table

A BILL

To reduce unemployment.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That part I of subchapter B of chapter I of the Internal Revenue Code be amended by adding at the end thereof the following new section:

"SEC. 16. LABOR-DIFFERENTIAL TAX.

"(a) RATE OF TAX.—In addition to other taxes there shall be levied, collected, and paid for each taxable year upon the labor-differential income of every producer a tax of per centum of the amount of the labor-differential income.

"(b) DEFINITIONS.—'Labor-differential income' means the gross income defined in section 22 (a), less the deduc-

FIG. 1—Facsimile of part of Bill offered by Senator O'Mahoney, which would offer a tax incentive for hand work at the expense of machine work.

have no purpose but that of raising revenue.

"The truth is that the Daggett Proposal proposes a universal collection from all producers for the purpose of financing rewards to all who employ labor, because, by the employment they give, and the purchasing power they spread through wages, all employers provide customers and markets for all producers.

"Seen in this light, a slight differential collection from the highly mechanized producer is not a destructive penalty, but, on the contrary, somewhat like an insurance premium, is a productive investment, ensuring and protecting one's own markets and volume of sales.

* * *

Details of the Proposal

"Administration of the Daggett Proposal for job protection calls for no new or extensive government agencies. The proposal can be administered by the present income tax bureau in the course of collecting income taxes.

"The amount of 'differential collection' from each producer and the amount of 'differential payment' claimable by each employer can be computed and shown upon the income tax blanks in very little additional space. The former can be added to the amount of income taxes payable, the latter deducted, and in the comparatively infrequent cases when the 'differential payment' exceeds both the 'differential collection' and the income tax payable, the difference can be shown and made the basis of government payments to the individual.

"It is suggested that the computation of the following items on each personal and corporate income tax report would effectuate the purposes of the Daggett Proposal:

(1) gross income, from all sources except compensation received for personal services but including the full amount of imputed wages received by 'self employers'

(2) total costs of deductible materials and supplies purchased

(3) total of claimable payrolls paid including claimable portion of imputed wages of 'self employers'

(4) excess, if any, of the first item over the second item, which may here be called 'total mark up' or 'value added'

(5) excess, if any, of the fourth item over the third, which excess may here be called 'nonlabor mark up'

(6) amount of 'differential collection' found by multiplying the fifth item by the rate of collections established by Congress

(7) amount of 'differential payment' found by multiplying the third item by the rate of payment established by Congress

(8) difference between the sixth and seventh items, which will be an addition to or a deduction from the income tax payable, and in the case of a 'differential payment' greater than 'differential collection' and income tax combined, will leave a balance payable by the government to the taxpayer.

Starts Moderately

"Under the Daggett Proposal it is not necessary that job protection be 'geared up' at the outset to the point of curing the unemployment problem completely.

"It is possible and perhaps preferable to set small rates of 'differential

GOODS ALMOST "UNTOUCHED BY HUMAN HANDS"—THE CIGARETTE INDUSTRY

Reference to the Statistical Abstract for 1938 shows that in 1935 there were 39 establishments with a "value of product" of $806,690,000, "cost of materials, fuel, and purchased electric energy" of $641,313,000, and "wages" of $18,345,000.

Using these figures to represent approximately the gross income, deductible materials and claimable payrolls of these plants, the average cigarette factory would show in that year approximately the following significant figures:

Gross income		$27,800,000
Deductible materials and supplies		22,100,000
Claimable payrolls	$632,000	
from which the following computations would be made:		
Total mark-up or value added		$5,700,000
Claimable payrolls		632,000
Non-labor mark-up		$5,068,000
2% differential collection		101,360
1% differential payment		6,320
Net differential collection		$95,040

equals 3/10 of 1% of $27,800,000, wholesale value of product.

It becomes apparent that the price of cigarettes would have to be raised about three-tenths of one per cent to meet the cost of this differential collection.

The negligible effect of this differential collection upon the market for cigarettes will be realized when it is realized that cigarettes are already taxed nearly 100% ad valorem, but sell in greater quantities each year. Federal cigarette taxes (not including State cigarette taxes) rose between 1933 and 1937 from $328,439,000 to $475,046,000, but the production of cigarettes increased in the same time from 114,877,163,000 cigarettes to 165,972,386,000 cigarettes.

FIG. 2—Example by Mr. Karsten, showing his plan as applied to a very highly mechanized industry.

PRODUCTS WITH HIGH "DIRECT LABOR" CONTENT—GARMENTS

In the same source, the "contract factories" making "men's, youth's and boy's clothing" show 1,230 establishments in 1935, with value of products amounting to $70,245,000, cost of materials, fuel, and purchased electric energy at $4,145,000 and wages at $48,998,000. From these figures, the average clothing factory in this group would approximate the following:

Gross income		$57,200
Deductible materials and supplies		3,070
Claimable payrolls	$39,000	
yielding the following:		
Total mark-up or value added		$54,130
Claimable payrolls		39,000
Non-labor mark-up		$15,130
1% differential payment		390
2% differential collection		303
Net differential payment		$87
as % of $57,200		0.16%

FIG. 3—Here is an example, submitted by Mr. Karsten, showing how his plan would apply to a "High Direct Labor Content" industry.

collection' and 'differential payment' experimentally with the purpose of observing the benefits of partial reemployment before proceeding to greater rates and complete cure.

"Thereafter the correct procedure may indeed prove to be one of 'hunting' in which from year to year the differentials established for the following year are determined afresh on the basis of the previous year's experience.

"In an experimental or 'proving ground' policy, the Congress might set such relatively low rates of 'job protection' as, for example, a 2 per cent 'differential collection' and a 1 per cent 'differential payment.'

"The effect upon the employer's labor costs is a 3 per cent reduction in the real cost of labor as compared with the cost of the use of substitutes for labor.

"Almost everyone may be assumed to know that as he lowers the price of his goods, he will increase the effective demand for them and the volume of his sales. The ratio between the percentage of marginal demand and the percentage of price change, for each per cent of price change, is called the 'marginal ratio.'

"The 'marginal ratio' of labor, according to the studies of Professor Paul Douglas, is 3 to 1. This means that each successive reduction by 1 per cent in the real cost of labor compared to the cost of substitutes, will be reflected in due time by a 3 per cent increase in the demand for human labor.

"Then the proposed 3 per cent job protection differential, being a reduction of 3 per cent in the real cost of labor compared to the cost of substitutes, will raise the demand for labor by 9 per cent. It is therefore to be expected that such a degree of job protection will increase the number of jobs in private employment by 9 per cent.

"If thirty-five million gainful workers are now employed in the United States, this degree of job protection would cause the employment of an additional 9 per cent or about three million workers.

"What effect would this moderate form of job protection have on the national income and the dollar-volume of business and trade?

"Roughly speaking, the proposed 9 per cent increase in employment without debasing wages will be reflected by a 9 per cent increase in the national 'labor income' or 'compensation for personal services' making this rise from forty-five billions to 49.1 billions.

"Nonlabor income, the other twenty-five billions of national income, usually fluctuates with labor income after a time lag, and should therefore also rise.

"But even if the latter did not rise by anything more than the decline in relief burdens, this 4.1 billions increase in labor income would lift the total national income from seventy billions to seventy-four (74.1) billions.

"This is an increase of about 6 per cent in the purchasing power of the domestic markets (from 70.0 to 74.1 billions), and hence in the dollar volume of American business.

"This is an increase of magnitude almost comparable to the nation's entire foreign markets.

"In the past years a change of a billion dollars in business profits shown by corporation tax reports has been reflected by a change of approximately one hundred millions in income tax and excess profits tax collections.

"Roughly then, a 4.1 billion dollar increase in profits would yield a 410 million increase in these taxes, or more than three times the contemplated 125 million dollar job protection collections.

"This would permit reduction in present taxes on business by more than a quarter billion dollars, or about 25 per cent of the present corporation income taxes.

"Here, briefly, is the argument for the Daggett Proposal as one which would not only eliminate low income taxes, but would reduce high income taxes for big business.

"And in this increase in the physical volume of production and consumption, we see higher standards of living for the consumers.

Effects Upon Mechanization

"We are now faced with the cream of the paradox that by legislation which can be interpreted as penalizing mechanization, the processes of mechanization are speeded up.

"We have seen that a 6 per cent increase in production is to be expected, in due time, to follow from a 2 per cent job protection differential collection and a 1 per cent job protection differential payment. This will require a 6 per cent increase in power or energy utilization.

"As long ago as 1935, machines provided about 98 per cent of the energy used in the Nation for productive purposes (omitting pleasure automobiles and non-productive machines). Man power provided about 2 per cent.

"A 9 per cent increase in the number of jobs, which we are here considering, would make a 9 per cent increase in the use of man power and lift the energy supplied by man power from 2 per cent to about 2.2 per cent.

"Wholesale substitution of the reemployed man power for machines cannot take place. Once installed, the ma-

(CONTINUED ON PAGE 69)

AUTOMOBILES

From the same source, combining the data for "motor vehicles, not including motorcycles" and "motor vehicle bodies and parts," we have the following approximations for 1935:

Gross income		$3,942,014,000
Deductible materials and supplies		2,817,238,000
Claimable payrolls	$545,414,000	

from which the following computations would result:

Total mark-up or value added	$1,124,776,000
Claimable payrolls	545,414,000
Non-labor mark-up	$579,362,000
2% differential collection	11,587,240
1% differential payment	5,454,140
Net differential collection	$6,133,100
as % of $2,391,090,000 (value of motor vehicles alone)	5/10 of 1%

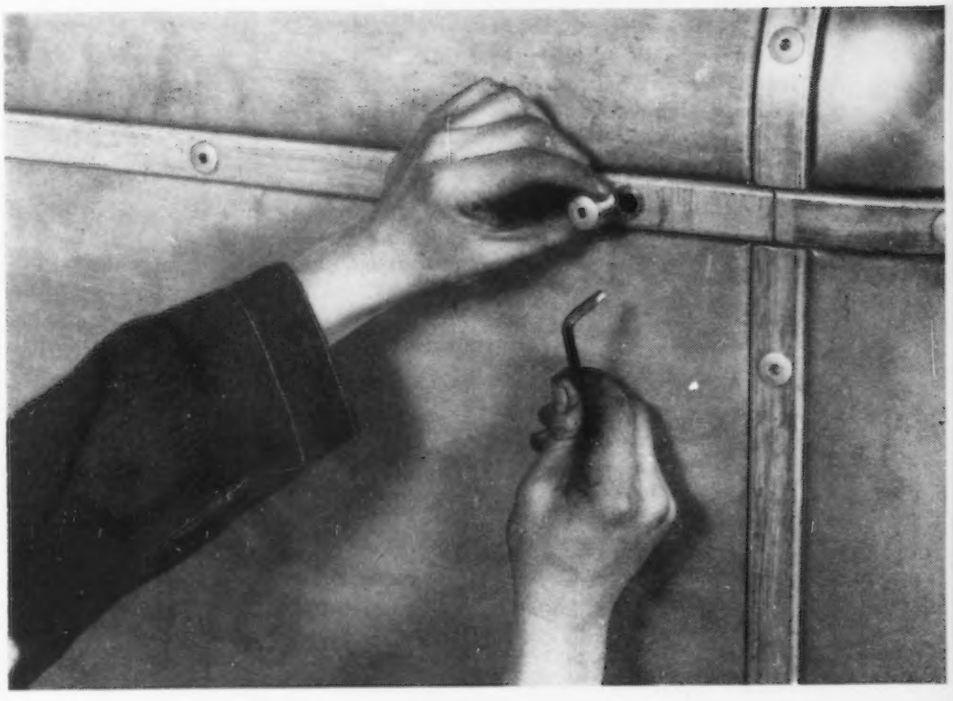
The negligible effect of this differential collection on the market for autos, will be clear when it is realized that federal excise taxes on autos, parts, tires, etc., were $77,255,000 in 1935 (and nearly twice as great in 1937) and state motor vehicle licenses rose from $281,517,000 in 1931 to $328,285,000 in 1937, but the number of cars registered in the registration states rose from 23,085,036 in 1932 to 28,520,559 in 1936, and passenger car production rose from 650,781 in 1932 to 2,397,718 in 1937.

FIG. 4—Another example, as applied to the Automobile Industry.

STEEL SHEETS A STRUCTURAL MATERIAL

THE new Lindsay structure (Dry-Zero Corp., Chicago) employs steel sheets both as a covering and as a structural material in the same unit. Neither rivets nor welds are required, nor are the sheets perforated for fastening.

The basic elements of the structure are as follows: The upper photo shows a panel sheet with patented edges being fitted into a channel and over the flange of the framing. "Tensioner" strips are applied over the edges of the sheets, and socket lock screws are screwed down to pull the "tensioner" into the flanged frame. The curved edges of the sheets are thus pulled downward, drawing the sheets taut. This assembly is continuous around all edges of each sheet.



Lindsay structure materials are fabricated by mass production methods to within ½ in. of any desired dimension. Erection requires no special training, and the only tool necessary is a socket wrench. The same structure may be used successively for varied purposes. Sections from one structure may be taken out and used in another different type of structure. For example, a truck body may be dismantled and the parts used in making an industrial building.

Dry-Zero Corp. makes no complete structures, but sells the necessary materials — framing members, panel sheets, and fittings.

An obvious application of the structure is for mobile units—motor truck bodies (lower photo), railroad cars, and marine superstructures — where light weight and rigidity are of primary importance. It can also be used in the construction of industrial buildings, refrigerator lockers, farm buildings, portable shacks, garages, and other structures of diverse uses. In case of accident, the damage can be isolated and the damaged sections replaced without disturbing other sections.

Interpretation of

NOT tests alone, but the choice of suitable tests and proper interpretation of the results are paramount in the determination of the suitability of various materials to particular applications. Last week the author described the characteristics of etch, fracture, tensile and shock resistance tests. Herein, in conclusion, consideration is given to hardness, wear resistance, torsion, endurance, bend, shear, compression, cupping and high temperature tests.

o o o

HARDNESS AND WEAR RESISTANCE: Hardness is a property that cannot be measured by a single type of test. The more usual conception of hardness is that it is the resistance to indentation, and most of the hardness tests are measures of this property.

Resistance to cutting or scratching must be added, and the value of file tests for hardness should not be overlooked. The file is one of the best means of indicating probable wear resistance of hardened steel products and can be applied to odd shapes such as gear teeth and bearings. A large amount of surface can be tested in a short time with a file, and it can be used to pick out local hard spots in cast iron at corners, fins, etc., that might give trouble in machining.

Limitations of the file test are that it distinguishes readily only parts that are or are not file hard and results depend considerably on the condition of the file and on the operator. Hamilton[4] has suggested drawing files to various hardness levels to distinguish different degrees of hardness of the work tested. The file test is essentially a measure of scratch resistance. Results usually have a rough relationship to indentation methods but may be very widely divergent. Thus file hardness may be obtained on high carbon austenitic surfaces when Rockwell "C" hardness is 30 or less. In such a case the file indicates resistance to scratching or cutting but is not a measure of strength such as resistance to plastic flow under load. On the other hand surfaces showing 65 Rockwell "C" may not be file hard and would be less wear resistant than those of lower Rockwell but still file hard.

Brinell hardness has been mentioned as a measure of tensile strength. It is to a certain extent a measure of wear resistance also, but since a steel ball is subject to distortion under pressure against the harder, more wear resisting steel surfaces, the Rockwell, Vickers, Scleroscope and other tests are more suitable for hardness tests of highly hardened metals. All the hardness tests are to a certain extent measures of machinability, capacity to cold form, etc., but other tests are necessary to supplement them.

Tests specifically designed to establish wear resistance have in general been highly unsatisfactory. A combination of conditions is likely to exist in service, and results of tests run dry, with and without abrasives, or with lubricants do not give the same order of rating. A few tests operated under specific conditions have been of value, but those where lubricants are involved have shown a lack of consistency in the test results themselves, let alone any reliable indication of service performance.

TORSION TESTS: Some of the results obtainable from torsion tests have been mentioned in connection with other tests already discussed. Hard brittle materials usually fail at approximately a 45-deg. angle in tension while softer more ductile materials fail in shear. Shear failure is usually transverse to the axis and for this reason circumferential surface defects are more damaging than longitudinal ones.

Failure may occur, however, chiefly in longitudinal shear. Such failures in shafts are sometimes said to be due to seamy surfaces when actually no seams were present in the original surface. Longitudinal shear failures are an indication of directional weakness such as from banding in the steel, stringers of inclusions, etc. Interpretations of results from standard specimens and even from static tests of full size parts are subject to the difficulties mentioned earlier under tensile tests. Knowlton[5] has reported extensive physical tests on tractor axle shafts and stated that torsion fatigue tests correlate with service while cer-

[4] "Note on the File Scratch Test," by W. C. Hamilton, *Metal Progress*, Vol. 32, No. 3, September, 1937, p. 265.

[5] "Physical Properties of Axle Shafts," by H. B. Knowlton, Transactions A.S.M., Vol. XXV, No. 1, p. 260.

TEST RESULTS

By O. W. McMULLAN
Youngstown Sheet & Tube Co., East Chicago, Ind.

tain other tests do not. He has found that static torsion tests do not produce the type of failure obtained in service. He emphasizes the influence of design on results.

Figs. 3 and 4 show the tension and shear types of fractures. Fig. 3 is that of an excessively hard axle shaft which failed in service. Complete failure took place suddenly along the contour of maximum tensile stress. Fig. 4 is that of a softer test specimen. Failure took place gradually in shear at right angles to the axis after considerable permanent twist occurred in the specimen. For a given size the hard specimen will carry a higher load but, on the other hand, if both were designed to carry loads near their maximum the hard shaft is more subject to sudden failure under momentary overloads.

ENDURANCE TESTS: Endurance test specimens are of various sizes and shapes, are loaded in different manners and tested at various speeds. Excessively high speeds apparently increase the endurance limit and give misleading results. Test specimens may be rotating beams loaded at the ends as a simple beam or at one end as a cantilever, flat strips which are bent back and forth, vibrating reeds, torsion bars, etc. Many of the standard specimens are small and highly polished and as such are suitable for comparative results to indicate possibilities under ideal conditions rather than how a particular part will perform in service. The term itself suggests an operating part and, perhaps more than with any other test, the test conditions should approach those in service to be of practical value.

Frequently, too, the actual endurance limit is of less interest than the number of times peak loads much above the endurance limit can be applied without damage. For example, a point, such as A on the S-N curve in Fig. 5, corresponding with the number of times a heavily loaded truck might be operated in low gear during its life, would be of more interest in computing allowable stresses in a given part than would the endurance limit as represented by point B. Loads received by bridges furnish a similar example.

Many tests of assembled units may be considered as being in the nature of endurance tests. The value of testing a few full size parts instead of a larger number of small standard specimens is becoming increasingly realized. Even more massive parts such as car wheels and rail sections are being tested under load applications comparable to those on the road. Rolling load machines have been quite successful relative to end hardness and formation of transverse fissures in

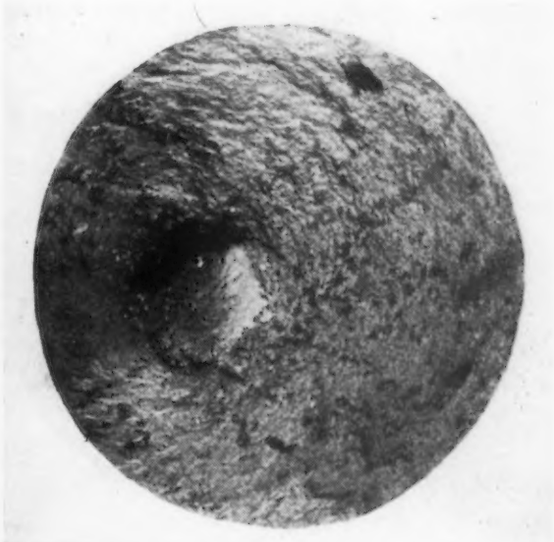


FIG. 4—Ductile or shear type failure of test specimen stressed in torsion. Protruding point and hole (dark) are torn out of metal at point of final failure. At 2½ diameters.

AT LEFT

FIG. 3—Brittle or tension type fracture of an axle shaft stressed in torsion. Natural size.

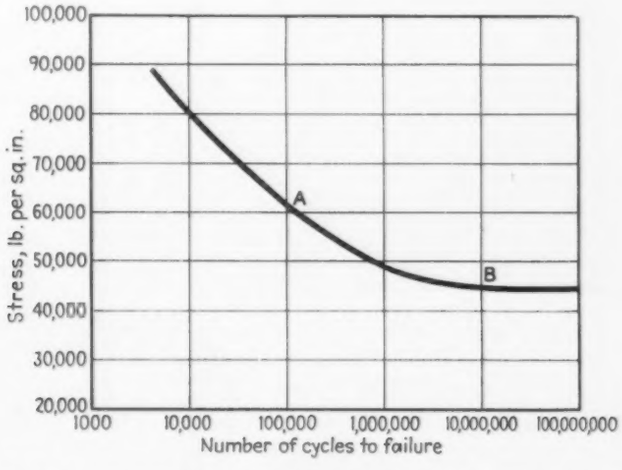


FIG. 5—Typical curve showing endurance limit of a steel specimen at various stress values.

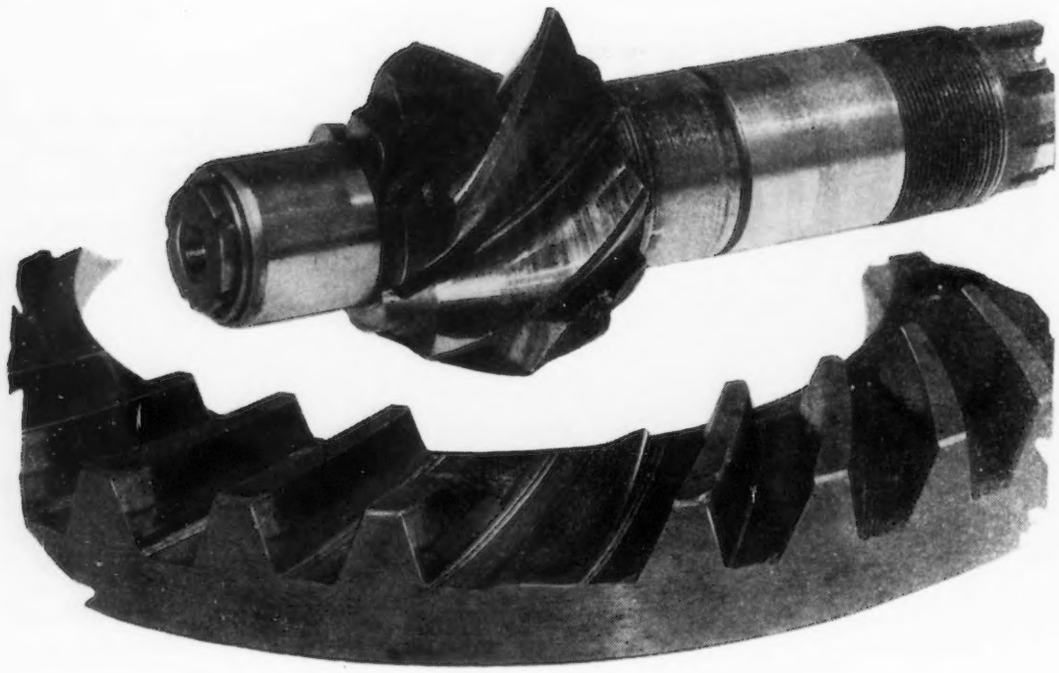


FIG. 6—Truck pinion and ring gear run heavily loaded to destruction. Life-108,000 pinion revolutions. Case structure of the SAE 4620 direct quenched pinion resisted tempering action of heat generated at tooth contact.

rails and in testing splice bars. Stress distribution in car wheels and brake shoe life are being determined on production parts with heavy rotating flywheels for application of dynamic loads. Such tests and performance in actual service show the inability of designing engineers to mathematically calculate stresses at peak loads, especially those from shock. Added to the difficulty are abnormal stresses from overloading, deflection in assembled parts, etc. Thus, even though allowable stresses of only 25,000 to 50,000 lb. per sq. in. are used in designing case hardened gears, gear failures still occur, making known that much higher stresses actually existed or else the stress formula used is not correct.

Operation imposes conditions, sometimes unanticipated or unknown, that lead to a different choice of materials or treatment than indicated by standard test specimens. A case in mind is that of results from dynamometer tests on truck rear axle assemblies. The results of static bend tests on case hardened steel of approximately SAE 3312 composition show that double treated specimens were 75 per cent stronger than similar specimens of direct quenched SAE 4620 steel. Yet in the dynamometer tests about 2½ times the life was obtained from the 4620 pinions. Figs. 6 and 7 show the appearance of the gears after the test. Both ring gears were of identical steel and treatment, the pinions only being different. The pinion of Fig. 6, 4620 steel, was in operation for 108,000

FIG. 7 — Test and materials here are the same as in Fig. 6, except pinion is made of double treated Ni-Cr steel. Life-44,000 cycles. Although much stronger at room temperature, the case of the Ni-Cr pinion was affected by the operating temperature and earlier failure resulted.

cycles, while the life of the 3312 pinion of Fig. 7 was 44,000 under similar loading and running conditions. With the double treatment given, the case of the 3312 steel was martensitic while the case of the direct quenched 4620 steel retained some austenite which, together with the influence of the molybdenum present, produced a pinion that did not lose its file hardness at as low a temperature as did the 3312 pinion. The dynamometer test imposed a new factor, elevated operating temperature from heat generated by friction, that changed the relative rating of the steels when given those particular heat treatments. Corrosive media resulting in surface or intergranular attack will greatly hasten failure in fatigue.

BEND TESTS: The use of the bend test for determining tensile strength was discussed under tensile tests. The bend test is used to investigate other characteristics also. Standard test specimens either round or rectangular, the latter preferred, may be used. Many of the tests are made by bending the specimen around a mandrel of specified diameter which is frequently expressed in terms of thickness of the test specimen. Such tests determine the angle to which the specimen can be bent without failure, the amount of elongation, the progress and type of fracture, influence of surface condition, etc. Nick fracture tests are made by notching the specimen. Sensitivity to the notch effect is indicated and from the appearance of the fracture the grain size, the presence of inclusions and some knowledge of the toughness is obtained. Other than standard specimens, such as full sections of pipes and shapes, give a better check on the performance of such products during fabrication and service.

A variety of bend test machines have been developed for strip and sheet metal. One is the Naumann-Schopper test which essentially consists of bending the specimen in the middle as a simple beam. The stress-strain curve is automatically recorded and shows the yield point. The Tour-Marshall machine performs a similar function but stresses the specimen as a cantilever beam. Reversed flexure tests are used to determine directional properties produced in sheets by rolling. Surface appearance of sheets after forming may be indicated by some simple forming operation such as in a roller former. Those tests are designed to show susceptibility to local deformation from high yield point elongation. Bend tests in general are simple to make but the results may be affected considerably by the procedure and apparatus used in making the test. As is the case with other tests, those which duplicate forming or service operations leave less chance for error in their interpretation.

COMPRESSION AND SHEAR TESTS: Compression tests and shear tests are not so universally applied to steel products as are tensile tests. Steel does not usually fail under strictly compressive loads except in special applications such as bearings. Reliable compression tests on standard specimens are rather difficult to make because of trouble in maintaining uniform application of load under heavy pressures. Shear strength is readily determined by punching holes in sheets or plates, shearing off pins in dies, etc., and those operations are quite similar in nature to those employed in fabrication or developed in service. The complicated stresses, including shear, occurring in riveted joints are best determined by testing a section of a joint if possible.

CUPPING TESTS: Cupping tests are of two types. One holds the specimen securely so that cupping is the result of plastic flow only while the other permits some slippage through the holding die. The test is rapid and probably the most widely used routine test to determine the drawability of flat products. From the shape of the cup, character of the break and appearance of the surface, information is gained concerning uniformity of the material, directional properties, presence of inclusions, grain size and surface condition. The usual size of the ball for forming the cup is 7/8 in. diameter. More recently an 8-in. diameter ball has been used. The large size is more informative as to surface condition because of the greater area covered.

The rapidity of cupping tests permits making a large number of tests to determine the uniformity of a product but it is usually considered desirable to make other tests also, particularly Rockwell B hardness

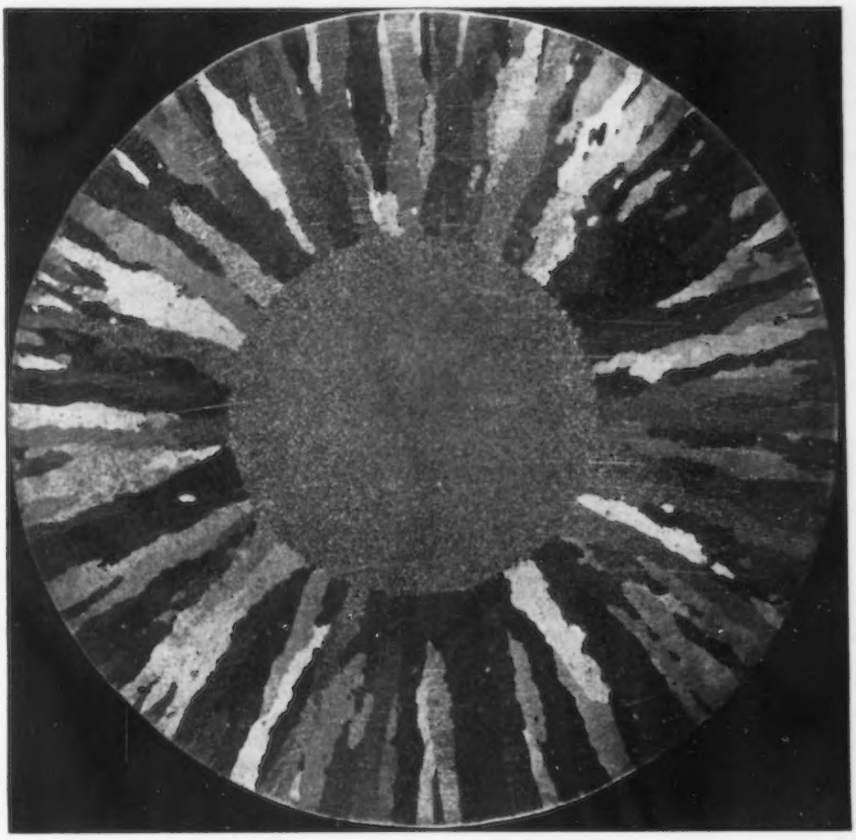


FIG. 8—Cross-section of tie rod from pipe welding furnace after ammonium persulphate etch. Center portion represents original fine grained structure. Coarse columnar ferrite grains on outside were produced by the combination of stress temperature and decarburizing atmosphere over a period of one year. At about 2 diameters.

tests and tensile tests, to predict the deep drawing characteristics.

HIGH TEMPERATURE TESTS: The most reliable high temperature tests have been those of long duration from which the rate of elongation or creep is determined at various loads. Many attempts have been made to develop reliable short time tests that would eliminate the expensive long tests. White, Clark and Wilson[6] found that a definite relationship existed at a constant temperature between the long and short time rupture properties of steels, studied with load as the variable. Kanter and Sticha[7] have presented data to show that for a given load condition a relationship between short and long time creep rates can be established with temperature as the variable. It must be remembered that internal changes in microstructure not fully developed in short time tests will have an influence on long time service. Any high temperature tests that do not include the effect of oxidizing or corroding atmospheres on reduction of section, intergranular attack, etc., will lead to erroneous interpretation of results if service involves contact with such gases.

Fig. 8 shows the macrostructure of a cross-section of a tie rod from a pipe welding furnace. The section was ground, polished and etched with ammonium persulphate solution. The tie rod was a rolled bar 2⅜ in. in diameter and had been in service for one year before failure. The original composition was: 0.13 C, 0.53 Mn, 0.010 P, 0.022 S, and 0.19 per cent Si. The outside columnar structure was reduced to 0.03 per cent in carbon by the decarburizing gases present. The structure as a whole is quite a remarkable one and at higher magnification the large columnar ferrite grains contain numerous twins, a structure seldom found in alpha iron. The combination of time, stress, temperature and atmospheric conditions was such as to produce the decarburization, grain growth and twinned structure shown. No short time test nor even a long time test that did not reproduce all of these conditions in the right combination would have predicted the results.

While much criticism has been directed against the use of standard test specimens that do not represent the size in which the article in use was heat treated, or are not machined from a location which is stressed the highest, or are not of equivalent surface finish to that of a part in service, it has not been the intention here to deny their value. It is believed that most tests, if properly applied and their limitations realized in the interpretation of results, have a field of usefulness. Tests with standard tensile or impact specimens or highly polished fatigue specimens may well serve as preliminary tests to narrow down the field to a relatively few compositions or treatments and leave the final selection to testing procedures more nearly duplicating the service conditions.

[6] "The Fracture of Carbon Steels at Elevated Temperatures," by A. E. White, C. L. Clark and R. L. Wilson, Transactions A.S.M., Vol. XXV, No. 3, p. 863.

[7] "Creep Rates from Tests of Short Duration," by J. J. Kanter and E. A. Sticha, A.S.M. 1939, Preprint.

Speculum Metal Revived

RECENT developments in electrodeposition have resuscitated an alloy that reached the height of its popularity in Greece and Rome some 400 years B. C. At that time no man or woman of fashion was without a *speculum* or mirror which was made from highly polished metal.

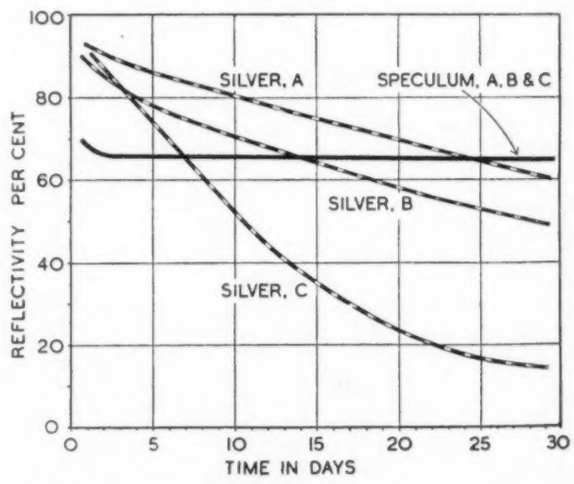
The mirror most in favor was a white alloy of copper with about 32 per cent of tin, cast into flat plaques with low relief ornament on one side. Although the metal was somewhat brittle, its smooth surface had reflecting qualities almost the equal of perfectly polished silver. Recent tests by the International Tin Research and Development Council to determine the white light directly reflected by various metals gave 90 per cent for silver, 61 per cent for chromium, 50 per cent for nickel, 49 per cent for stainless steel, and 70 per cent for white bronze speculum.

Silver, however, discolors and is easily scratched. On the other hand, the white bronze mirrors do not tarnish and their hard surface resists scratching. But, eventually the solid metal mirror, durable though cumbersome, was displaced by glass backed with a thin coating of tin or silver, very similar to the mirrors of today.

Although speculum metal dropped out of domestic use, its excellent, reflecting qualities were utilized by astronomers from the earliest times, and it is still used today for a variety of optical instruments. In 1842-45, for instance, William Rosse—Lord Parsons—produced the famous 6 ft. diameter speculum with which he made very important astronomical observations. Now, after centuries of banishment from the domestic sphere, this alloy is showing a tendency to come back into popular use through the development of a new art of simultaneously plating on to any suitable base metal a thin coating of copper and tin in such proportions as to give a true reproduction of the ancient speculum metal. The surface so formed has all the properties of cast speculum. It is hard and durable and, at least indoors, its warm brilliance is said to remain untarnished for an indeficite time.

Another characteristic of this coating is its pleasing color, which combines the whiteness of silver with a suggestion of warmth that is most attractive. Hitherto many of the commonly used tarnish resisting metals have been characterized by a cold and almost bluish tinge, but this new alloy will likely permit many new decorative treatments.

Several applications for the speculum electroplating process are now being studied, including reflectors for optical instruments, headlamps and torches; unbreakable shaving mirrors for soldiers; shop fittings; lavatory taps and metal fittings; table hardware, ornamental metal work, and so forth.



RETENTION of reflectivity of speculum metal and silver. Samples A were exposed in an office with steam heat, samples B in a living room with coal fire, and samples C in a kitchen.

CASTING TEMPERATURES FOR NON-FERROUS ALLOYS

THE effect of pouring temperatures on the production of bronze castings seems to be connected with the amount of gas present in the metal and the cooling rate required to maintain the gas in solution, according to a recent article in the *Foundry Trade Journal*. For example, in metal likely to contain much gas, better results are usually obtained by increasing the rate of solidification either by lowering the casting temperature or by chill molds. Similarly, thin-sectioned castings are not so susceptible to variation in casting temperature as heavy articles. Accordingly, it would appear that if foundrymen take the necessary steps to prevent gas absorption during melting, as far as possible, or alternatively degasify the metal before casting, the effect of pouring temperature will be less critical and production will be facilitated.

Suitable pouring temperatures for some of the principal non-ferrous metals and alloys are shown in the accompanying table. A useful rule to keep in mind for roughly determining the pouring temperature of sand-cast articles is to allow 15 per cent superheat over the melting point for light work, 10 per cent for average and 7 per cent for heavy sections. In the case of ingot production, 10 to 7 per cent superheat is usually ample according to the size of ingot being produced.

In castings of variable thickness, pouring temperature should be determined according to the metal section in the thinnest parts. This will, in the majority of cases, entail the use of a slightly higher temperature in the heavier sections, but this is an advantage rather than otherwise, provided definite precautions are taken for feeding and the metal is free from excessive gas.

Suitable Casting Temperatures for a Number of Non-Ferrous Alloys Arranged by Section Thickness

Metal or Alloy	Composition, Per Cent	Approximate Melting Point, Deg. F.	Pouring Temperature for Castings, Deg. F.		
			Light *	Medium *	Heavy *
Aluminum	99 Al	1,215	1,400	1,346	1,292
Aluminum alloy	Y and R. R. types	1,148–1,175	1,346	1,310	1,274
Aluminum-silicon alloy	87-90 Al, 13-10 Si	1,058	1,292	1,220	1,148
Aluminum-copper alloy	93 Al, 7 Cu	1,166	1,346	1,310	1,274
Admiralty gunmetal	88 Cu, 10 Sn, 2 Zn	1,760	2,192	2,120	2,048
Aluminum bronze (ingots)	88 Cu, 9 Al, 3 Fe	1,913	2,192	2,102	2,012
Brass (castings)	73 Cu, 22 Zn, 4 Pb, 1 Sn	1,832	2,264	2,192	2,120
Brass (ingots)	70 Cu, 30 Zn	1,778	2,012	1,958	1,904
Brass (ingots)	60 Cu, 40 Zn	1,652	1,922	1,832	1,778
Copper	99 per cent	1,981	2,192	2,120	2,066
Copper-nickel alloy	96 Cu, 4 Ni	2,048	2,336	2,282	2,228
Copper-lead alloy	70 Cu, 30 Pb	1,778	2,012	1,922	.....
Copper-lead bronze	75 Cu, 21 Pb, 4 Sn	1,832	2,102	2,012	.....
Cupro-nickel (castings)	30 Ni, 0.5 Si, 1 Mn, 1 Fe, Cu bal.	2,228	2,642	2,570	2,507
Cupro-nickel (ingots)	80 Cu, 20 Ni	2,156	2,480	2,372	.....
Cupro-nickel (ingots)	70 Cu, 30 Ni	2,228	2,552	2,462	.....
Gunmetal	85 Cu, 5 Sn, 5 Zn, 5 Pb	1,868	2,156	2,084	2,012
Leaded bronze	80 Cu, 10 Sn, 10 Pb	1,706	1,994	1,922	1,832
Manganese bronze	38 Zn, 0.7 Mn, 1 Fe, 0.5 Al, Cu bal.	1,607	1,922	1,832	1,760
Monel (normal)	1.5 Si, 1 Mn, 2.5 Fe, 66 Ni, Cu bal.	2,462	2,840	2,786	2,732
Monel (silicon)	2.75 Si, 1 Mn, 2.5 Fe, 66 Ni, Cu bal.	2,408	2,786	2,732	2,678
Monel ("S")	3.75 Si, 1 Mn, 2.5 Fe, 66 Ni, Cu bal.	2,336	2,732	2,660	2,588
Nickel bronze	88 Cu, 5 Sn, 5 Ni, 2 Zn	1,976	2,228	2,192	2,156
Nickel bronze	30 Ni, 10 Sn, 8 Pb, Cu bal.	2,048	2,444	2,372	2,300
Nickel bronze	40 Ni, 10 Sn, 1 Zn, Cu bal.	2,156	2,552	2,462	2,372
Nickel silver	20 Ni, 15 Zn, 3 Sn, 5 Pb, Cu bal.	1,958	2,462	2,372	2,282
Nickel silver (ingots)	63 Cu, 20 Ni, 17 Zn	1,976	2,282	.....	.....
Nickel (castings)	1.5 Si, 1.25 Mn, 0.3 C, Ni bal.	2,552	2,894	2,822	2,732
Phosphor bronze	11 Sn, 0.25 P, Cu bal.	1,814	2,012	1,940	1,868
Phosphor bronze	11 Sn, 0.5 P, Cu bal.	1,796	1,976	1,922	1,850
Phosphor bronze	11 Sn, 1.0 P, Cu bal.	1,778	1,958	1,904	1,832
Phosphor bronze (nickel)	11 Sn, 1.0 Ni, 0.5 Zn, 0.05 P, Cu bal.	1,832	2,102	2,030	1,940
Tin bronze	90 Cu, 10 Sn	1,832	2,120	2,048	1,976
Tin bronze	85 Cu, 15 Sn	1,742	2,012	1,940	1,868
Tin-base bearing metal	89 Sn, 7.5 Sb, 3.5 Cu	680	.....	806	.....
White metal (sea water)	70 Sn, 1.5 Cu, Zn bal.	.....	.....	896	.....

*Light castings—under ½ in. in section. Medium castings—½ in. to 1¼ in. in section (test bars). Large castings—over 1¼ in. in section.

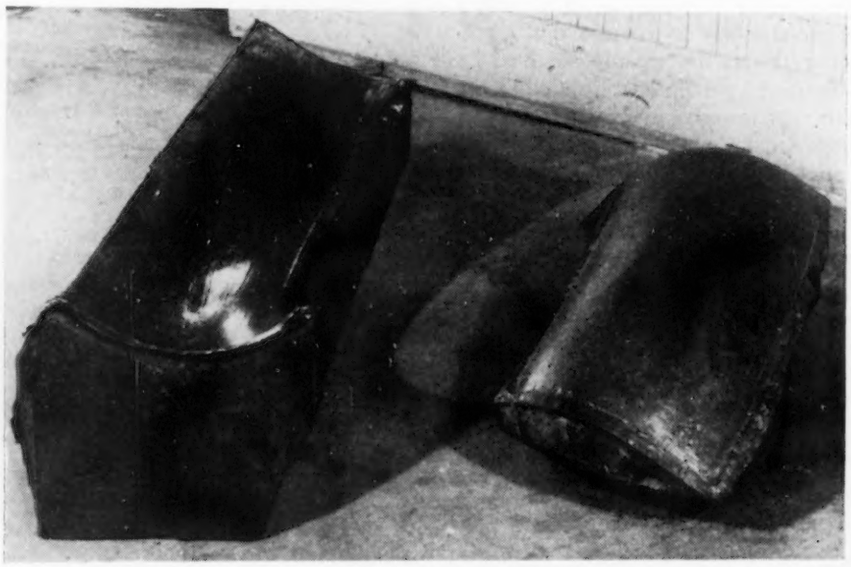
STEEL-FACED CAST IRON DIES

MUCH has been written lately about the drop hammer technique currently being used in the production of aircraft stampings in small quantity runs, with particular reference to the employment of combination lead-zinc dies. [THE IRON AGE, Oct. 19 and 26, 1939, and Feb. 8, 1940.] Less well known are the steel-faced, cast iron dies developed by Engel Aircraft Specialties for use in conjunction with lead male dies.

There is much to be said in favor of cast iron—the traditional stamping die material. Its availability is obvious and its cost is considerably lower than zinc, pound for pound. Compared with straight zinc, its physical properties are much higher, although this comparison suffers considerably when speaking of the zinc-base alloys of high tensile strength which are now rapidly replacing straight zinc as a drop hammer die material. As in the case of the zinc alloys, advantage can be taken of the greater strength over straight zinc to employ lighter sections and hence obtain dies of lighter weight. Also, as in the example of zinc dies, cast iron dies can be broken up and recast after they have become obsolete, although one of the advantages of cast iron is its long life as a die material.

The reason the aircraft industry adopted zinc-lead dies was largely a matter of economics. With the short production runs prevailing in the industry, die costs had to be kept to a minimum, and since labor cost is the biggest factor in die costs, the amount of work done on a die had to be cut to the bone. Zinc casts very cleanly even in a sand mold and the only subsequent work required to finish the die cavity is usually a polishing operation with a portable disk buffer. Cast iron has a much more uneven surface as-cast and takes considerably more effort to smooth up so as to prevent any scratches appearing in the finished stamping. When the two halves of the die are cast iron, the problem of matching and die tryout is even more tedious and costly.

Despite these apparent disadvantages, cast iron female dies have been used in the Engel shop in sizes varying from 20 to 1500 lb. in weight. The surplus weight has been kept down to a minimum to save expense and facilitate handling. These dies have been polished for fine work or have even been used with just a rough finish. Naturally the casting is done with all precautions to get as smooth a finish as possible.



ANOTHER example of a metal liner applied to a cast iron die. At the right is the mating punch, made entirely of lead.

Steel-Faced Dies

To reduce the labor of smoothing and finishing cast iron female dies, there was devised a scheme of facing the cavity with 16 to 18 gage cold rolled or deep drawing sheet steel, hammered into the die by the regular drop hammer process. This procedure necessitates only minor touching up on the cast iron die and very little retouching on the lining. These linings are usually bent over the edges of the die and at times are secured with a few bolts. These bent-over edges assist in preventing damage to the material which otherwise might be injured in the hammering process if a rough casting were exposed. If the liner has to be polished in any particular place, it can be taken out and the rough spots hammered out by power tools and then polished. Naturally the cast iron die has to be designed and built to allow for this liner. Another feature of this process is that an extra liner can be formed which may be used as a pattern for marking holes or locations on the stampings. This type of sheet pattern is most accurate and has been developed into a positive duplication process.

In deeper dies these metal linings are best inserted by cutting slots in steep places and welding the edges of split sections of the lining after form-

FOR DROP HAMMER WORK ◇ ◇ ◇

By JOHN H. ENGEL
Engel Aircraft Specialties, Escondido, Cal.

ing them into shape. If soft welds are made, they can be power hammered and reduced to the same thickness as the previous material.

Male Dies

Past experience with all type sheet metal and die material led to a preference for soft lead male dies. The preference for lead is due to the fact that the male die can readily be formed by forcing the sheet clearance with regular blanks instead of following the conventional practice of tedious filing and checking required in order to obtain the proper fit. Another advantage of soft lead male dies is their constant reseating during use. These advantages can be brought to maximum use if the whole die is designed for that purpose. These various methods can be used with great speed after sufficient experience has been obtained. Their flexibility is of particular help in difficult designs.

On the other hand, if large soft lead dies are used, they have a continuous tendency to get out of shape and as a result will shear the mounting bolts and start overlapping at undesirable places. By making the main body of the die of cast iron and facing it with approximately 1 to 2 in. of soft lead, these difficulties are reduced to minor obstacles. In order to attach this layer of soft lead securely to the iron casting, the face of the male die is studded with lugs which are cast right into the iron. The anchoring bolts which fasten these dies to the drop hammer are screwed into tapped holes in the cast iron body.

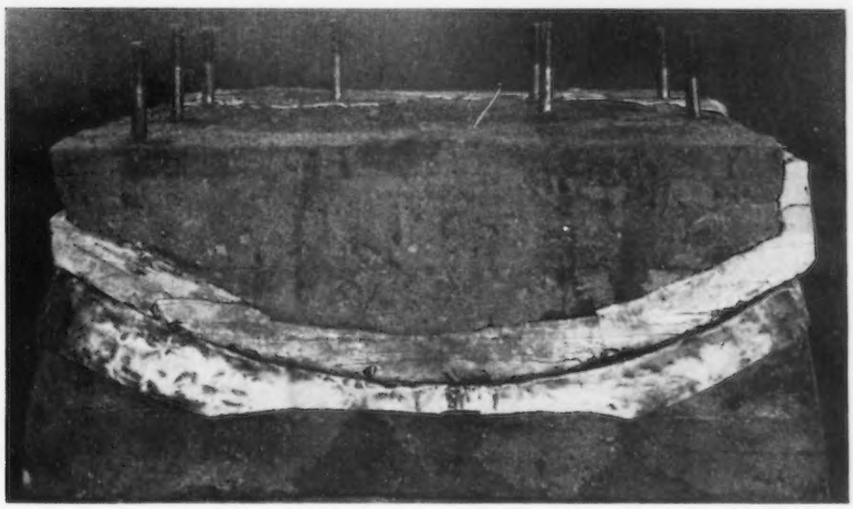
Due to the softness of these lead male dies, stretching of the steel liners of female dies is never experienced.

Naturally to get the maximum advantage from these self-seating male dies certain precautions have to be taken, since there are also numerous disadvantages incident to this process. However, if the dies are built so that they will constantly reshape themselves, the objections practically can be eliminated. If these male dies are severely attacked by excessive wrinkling in certain sections, a metal facing is applied to the male die. This metal facer may consist of a regular stamping anchored to the die, or a harder piece of steel made by the same process may be anchored to the male die. This anchoring at times can be done without any special effort; occasionally a few screws will suffice. If certain sections of the stamping still cause damage to the male die, a slight reinforcement may be slipped into that particular place on the inside of the liner.

No accurate data has been kept as to the comparison in price of polished surface dies or of these metal linings. But the writer believes that the metal lining on large dies has advantage over polished zinc dies. These advantages are in first cost, maintenance, storage, pattern layout simplification, and excellence of product.

These combination steel-faced cast iron dies have been used for making stampings from light gage aluminum alloys to chrome-molybdenum (X4130) sheets 0.094 in. thick.

DIE set for engine cowling with forced out streamlines. Lower die is of cast iron lined with a cold rolled sheet. The body of the upper or male die also is of cast iron, but is faced with 2 in. of soft lead.

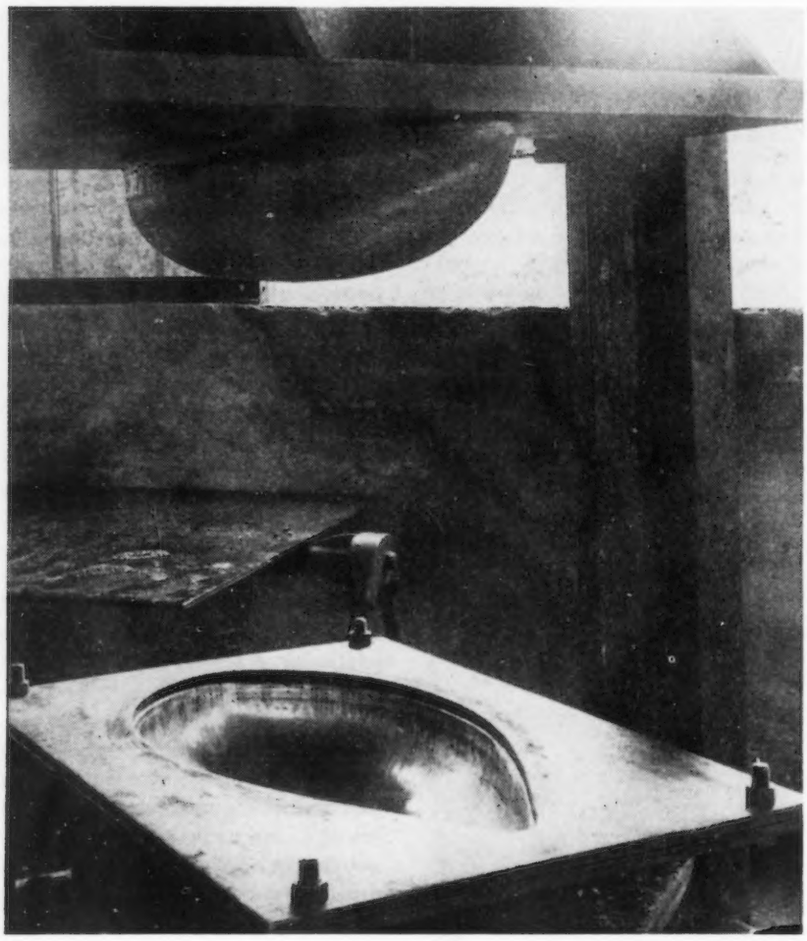


Controlling Wrinkles

One of the chief problems in drop hammer work is the avoidance of wrinkles in the sheet. Rubber pads are sometimes used to hold back the formation of wrinkles, but their application requires considerable skill on the part of the operator. This rubber padding process is practically limited to the softer alloys and cannot be applied very readily to such tough materials as stainless steel. Another method frequently used to prevent wrinkles is one in which laminated wood retarding

type slippage blanks are employed. However, in drop hammer work such wood forms (THE IRON AGE, Oct. 19, 1939, p. 54) are subject to constant deterioration and occasionally a splinter of wood drops into the die at the wrong time, resulting in damage to the stamping.

To overcome these drawbacks, the new method was developed, consisting of clamping the material between two ½-in. steel plates. At first springs were used to control the clamping pressure, but later ordinary bolts, clamps and eccentric locks have been used to secure the plates together. Their choice is governed by the quantity of production involved.



WRINKLES can be avoided through the use of slippage controlling plates made of boiler steel. The edges of this finished wheel pants stamping are held between the adjustable plates shown on top of the female die.

Engel company replaced plywood with steel plates ⅛ to ¼ in. thick. Their increased cost is compensated for by increase in production as well as improvement in uniformity and quality of the stampings. These production improvements are due to the more uniform control that can be more readily applied to steel plates than to plywood. They do not deteriorate rapidly and are infinitely better for producing stainless steel parts.

On large dies these steel slippage retarding blanks are rather difficult to handle owing to their weight. Hence a

Aluminum alloy stampings cannot be produced very satisfactorily in this manner, however, without a further modification of this technique. As wrinkles are formed they are hammered out locally through the use of steel blocks placed on top of the steel plates, the drop hammer upper platen being used to deliver the blow. These steel blocks are provided with handles, and due to their resemblance are indentified as hatchets. Two hatchets are employed during the operation, one being applied by the hammer operator and the other by his helper on the opposite side of the hammer. A systematized procedure is followed by which both operators slide the hatchets in opposite directions over the wrinkles. The hammer is constantly pounding on these hatchets while they are being guided over the wrinkles underneath the plates. When the wrinkles have been sufficiently removed, the top die is again let down on the blank in order to continue the forming process into the die. If wrinkles should form again, the same procedure for removing them is applied. This method can very easily be systematized and can readily be handled by semi-skilled mechanics.

Another system that has been used successfully in the manufacture of 3/32-in. thick SAE 4130 steel (chrome molybdenum) is by installing the female die on the movable hammer and the male die on the base. In these particular installations a large number of loose plates ½ in. thick are placed on the rim of the male die. The stamping process is started with approximately ½ in. of the male die protruding past the top plate. The successive steps consist of removing one plate at a time and increasing the drawing depth by the additional ½ in. space gained. At each stage the resulting wrinkles in the stamping are forcefully removed by pounding them between the female die and the steel plates. This particular process is suitable for forming stampings while they are hot, and can be used for single as well as quantity production.

With regard to the plates, they may be reinforced on the edges or may be formed into shapes to fit various curvatures, risers and depressions around the die. At times only a single plate is necessary, in which case the die top takes the place of the lower plate. These plates can also be used as a ring die and may be supported by a frame.

The plates may be made from boiler plate or cold rolled steel, depending on the finish desired. These plates may be given a high polished finish or roughened in certain localities to give better control of the desired slipping action. Oil and grease in varying amounts can be used to advantage for slippage control. These various applications of steel plates depend largely on the thickness of the material to be formed, the amount of slippage or stretching desired, and numerous other preferences of the particular manufactured product.

Current Metal Working Activity

Latest Data Assembled by THE IRON AGE from Recognized Sources

	February 1940	January 1940	December 1939	January 1939	12 Months 1939	12 Months 1938
Steel Ingots: (net tons)						
Monthly output[a]	4,374,625	5,619,698	5,784,150	3,174,352	51,261,166	27,752,225
Average weekly output[a]	1,056,673	1,268,555	1,308,631	716,558	983,145	532,072
Per cent of capacity[a]	69.62	83.58	85.57	52.48	64.29	39.65
Pig Iron: (net tons)						
Monthly output[b]	3,311,480	4,032,022	4,220,536	2,436,474	35,317,374	18,782,236
Raw Materials: (net tons)						
Coke output[c]		4,945,368	5,031,797	3,444,256	44,425,123	32,495,800
Lake ore consumed[d] (gross tons)		5,289,308	5,538,374	2,926,706	44,361,289	25,703,050
Scrap iron and steel consumed[r]		3,775,000	3,805,000	2,495,038	35,006,000	21,528,000
Castings: (net tons)						
Malleable, orders[e]			45,978	38,105	489,482	289,384
Steel, orders[e]		43,121	64,143	42,972	685,074	333,278
Finished Steel: (net tons)						
Trackwork shipments[a]	6,898	6,762	6,768	2,909	69,250	37,336
Fabricated shape orders[f]		75,830	84,383	101,712	1,305,049	1,256,639
Fabricated plate orders[e]		33,804	23,627	20,511	357,393	285,061
U. S. Steel Corp. shipments[g]	1,009,256	1,145,592	1,443,969	870,866	11,707,251	7,315,506
Fabricated Products:						
Automobile production[h]		465,000††	469,120	356,962	3,732,508	2,655,171
Steel furniture shipments[e]		$2,263,633	$2,159,729	$1,782,791	$22,609,168	$20,355,973
Steel boiler orders[e] (sq. ft.)		525,443	553,796	1,130,612	11,098,316	4,199,442
Locomotives ordered[i]		28	127**	8	415	228
Freight cars ordered[i]		209	4,381**	3	56,915	16,539
Machine tool index[j]	92.9	93.3	93.3	52.5	70.0	*
Foundry equipment index[k]	179.4	197.9	164.8	122.3	196.5†	106.5†
Non-Ferrous Metals: (net tons, U. S. only)						
Lead shipments[l]		39,875	44,881	40,189	555,074	421,625
Lead stocks[l]		68,539	58,777	117,214	.....	.....
Zinc shipments[m]	53,048	57,551	53,468	42,639	598,972	395,554
Zinc stocks[m]	67,086	65,602	65,995	128,407	.....	.....
Tin deliveries[n] (gross tons)	6,600	9,780	11,366	4,330	71,896	50,660
Refined copper deliveries[o]	72,809	108,465	107,380‡	54,827	948,559	607,672
Refined copper stocks[o]	145,393	135,441	159,485	301,244	.....	.....
Exports: (gross tons)						
Total iron and steel[p]		.....	600,437	362,672	6,076,429	5,148,006
All rolled and finished steel[p]		.....	280,992	107,552	1,883,506	1,392,703
Semi-finished steel[p]		.....	78,636	15,442	328,893	249,635
Scrap[p]		.....	204,298	225,434	3,551,589	2,974,375
Imports: (gross tons)						
Total iron and steel[p]		.....	14,709	27,664	315,161	264,550
Pig iron[p]		.....	1,318	586	38,592	33,088
All rolled and finished steel[p]		.....	3,346	18,026	156,707	155,535

†Three months' average. *Not available. ††Preliminary. **Includes yearly adjustments. ‡Five-months' average.

Source of data: [a] American Iron and Steel Institute; [b] THE IRON AGE; [c] Bureau of Mines; [d] Lake Superior Iron Ore Association; [e] Bureau of the Census; [f] American Institute of Steel Construction; [g] United States Steel Corp.; [h] Preliminary figures from Ward's Automotive Reports—Final figures from Bureau of the Census, U. S. and Canada; [i] *Railway Age;* [k] Foundry Equipment Manufacturers Association; [l] American Bureau of Metal Statistics; [m] American Zinc Institute; [n] New York Commodity Exchange; [o] Copper Institute; [p] Department of Commerce; [q] British Iron and Steel Federation; [r] Institute of Scrap Iron and Steel.

THIS WEEK ON THE ASSEMBLY LINE

By W. F. SHERMAN
Detroit Editor

. . . General Motors to construct plant to manufacture new steering gear . . . Packard reveals work on 1200-hp. marine engines for "torpedo fleet" . . . Production of 105,720 units last week indicates continued high level and stability of output . . . GM figures provide comparison of "seasonal" declines in 1939 and 1940 sales.

DETROIT—Periodically the automobile industry finds attention centered on relatively small mechanisms which entail major tooling programs and frequently indicate a trend of major importance. It appears to be in this stage now, with the steering gear mechanism playing the lead role.

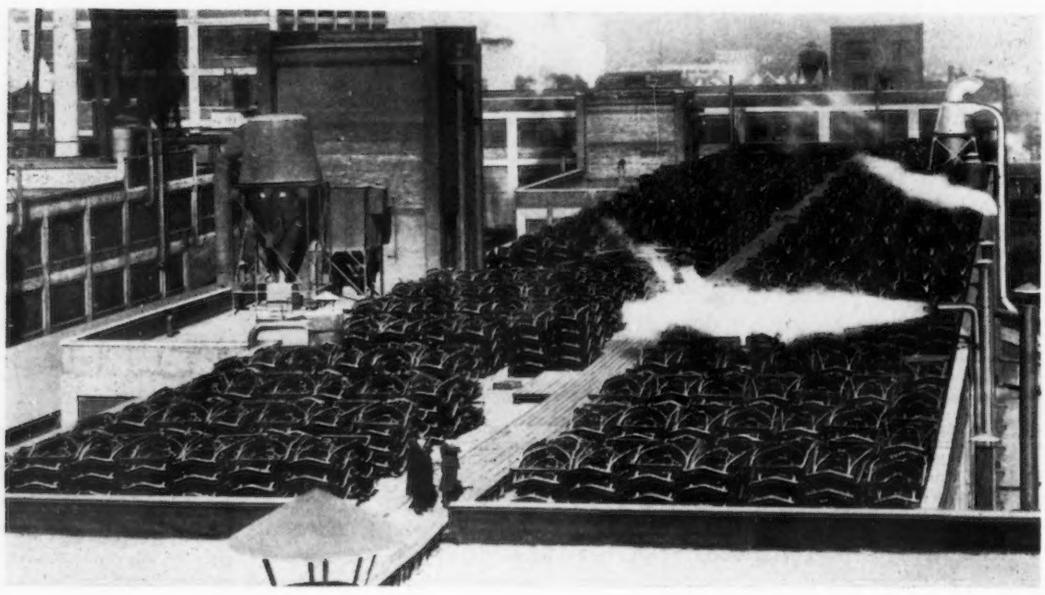
Ease, comfort and safety of steering—along with other items which contribute to car controllability—are always problems for automobile designers. Some new designs need more correction than others, but almost every new car groomed for introduction to the market is in need of some correction.

A new type of steering gear, said to have definite advantages from the standpoint of safety, as well as offering freedom from excessive backlash in off-center positions, is ready for use on 1941 cars. Importance of the new steering gear is attested by the fact that the Saginaw Steering Gear Division of General Motors will erect and tool up a $100,000 plant immediately to produce the new mechanism.

The design itself and special tooling problems involved in its production have proved to be exceedingly interesting. The design, produced by Walter A. Kull and Alva W. Phelps, is known as the "recirculating ball type gear." It consists of a worm with a ground helical groove running within a nut with a similar ground mating groove, the grooves being filled with steel balls. A ball-return tube transfers the balls from one end of the nut to the other, hence the term "recirculating."

Special grinding methods have been developed which permit a great degree of accuracy—because the fit between the worm and nut must be close enough so there will be no backlash or appreciable clearances between these parts, according to Mr. Phelps, general manager of the plant. Although no details of manufacturing process have been revealed yet, it is known that many special problems are involved in manufacturing this mechanism on a large scale and the Saginaw pilgrimages of machine tool experts are not likely to cease until the new plant is safely in operation next fall. It has been revealed that in order to allow for greater wear on the contacting surfaces of the rack and pinion when the gear is in the "straight-ahead driving" position the teeth are so cut that they mesh closely in the central position but with some backlash in off-center positions. But the pinion teeth are cut so the proportion of addendum and dedendum varies across the face of the pinion and the amount of backlast in off-center positions is a minimum compared with present steering gear mechanisms. The pinion is generated in a gear shaper with the cutter head tilted at an angle with the work.

There may some day be applications of this mechanism for other power transmission jobs besides automotive



"FLOAT"—2,700 frames, a little more than two days' production requirements, are kept in reserve at Dodge Main plant as a safeguard against possible interruptions of delivery. F. J. Lamborn, vice-president in charge of manufacturing, and O. H. Jacobs, production supervisor, inspect the roof-top storage area where half a million pounds of frames are kept. Next to engines and bodies, frames are the heaviest units used in automobile assemblies.

ACCURACY . . .

gave it to 26 million

AS late as 1920, the whole world of radio was populated only by a handful of men laboring with expensive apparatus. Twenty years have seen radio leap from a laboratory process to a commonplace part of everyone's daily life. Accuracy makes the difference. Accuracy in manufacturing processes—machine tool precision to ten-thousandths—brings immeasurable benefit to all civilization. Accuracy results in lower costs, increased production, extra hours of leisure . . . and thousands of *new* job-making conveniences and services.

In 1860, Francis A. Pratt and Amos Whitney founded a company whose basic policy was the development of increased accuracy. Succeeding generations of Pratt & Whitney craftsmen have vigorously pursued the same ideal. Today over 2000 skilled Pratt & Whitney workers build machine tools, cutting tools and gages that skillful managers use to reduce costs, expand output and win new markets. When you buy new equipment, investigate Pratt & Whitney machine tools, small tools and gages. They pay big dividends.

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steering. One of the claims made is that working load efficiencies have been increased more than 100 per cent over conventional screw and nut mechanisms. It is obvious that the design permits the use of an unlimited number of balls in contact under operating conditions merely through the increase in the length of the rack or nut which contains the passageways for the balls. Automotive tests have shown that this type of gear has from three to four times greater life than present high efficiency gears for the same applications.

Packard Marine Engine

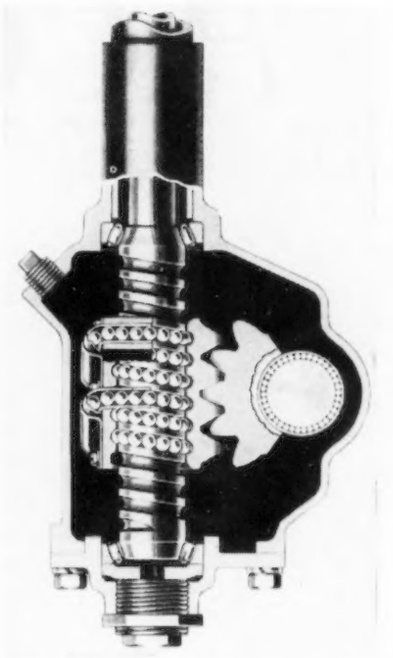
First mentioned in THE IRON AGE late last year, Packard's activity on high-powered marine engines is now in the limelight in a current *Collier's* article dealing with the new "torpedo boat fleet" which is being built for the United States Navy. Packard has been working for some time on a $2,000,000 Navy contract for 81 super-marine engines and for the development and testing of seven experimental engines. They will develop 1200 hp. each and are scheduled for delivery this year.

The engines are a development of the ones used by Gar Wood, of Gar Wood Industries, Inc., in his successful defenses of the Harmsworth Trophy for speed boats. Origin of the design in the 60-degree V-12 water-cooled aircraft engine originally developed for the Army and Navy, and the design also stems from experiences in the production of the Liberty airplane motor during the World War. However, the aircraft engine had an approved rating of only 800 hp. Over a period of years the power has been increased by stages from 800, unsupercharged, to something over 1200 at 2400 rpm, supercharged.

The Packard contract is a phase of the current Navy program which includes a $15,000,000 appropriation for experimental surface vessels to operate at high speed in rough seas, unarmored, but carrying four or more torpedoes. The Navy has ordered 24 of the "torpedo boats" (reportedly of British design, by the way), from the Electric Boat Co. These and others to be built will be equipped with the Packard engines.

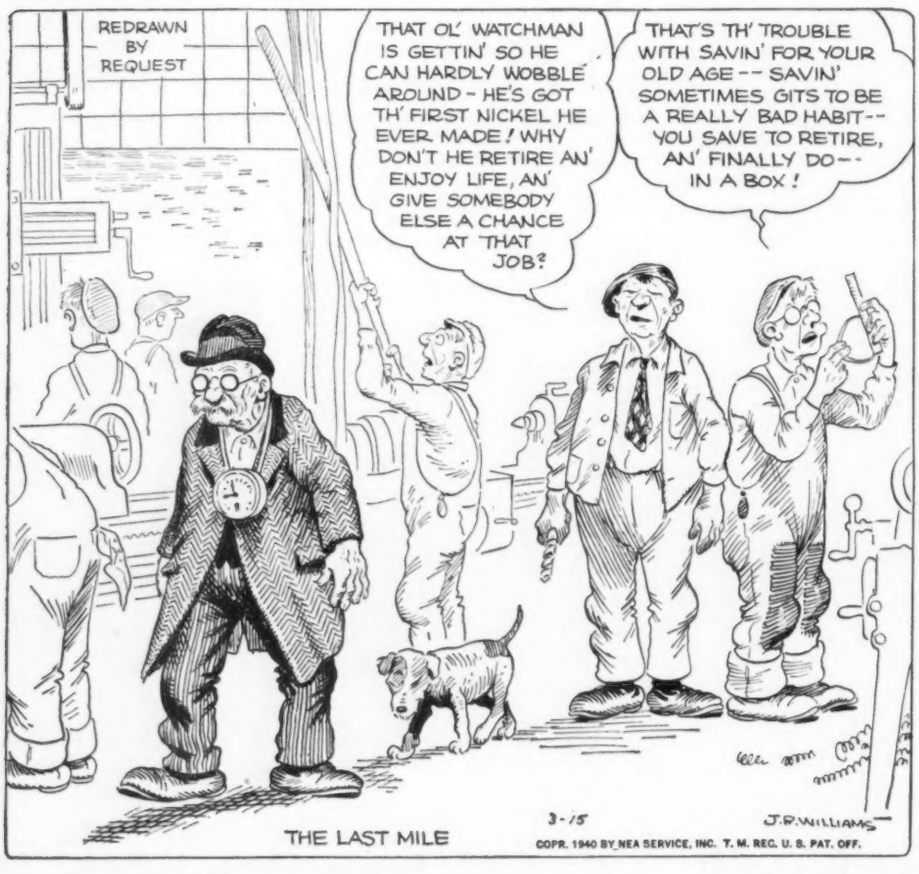
Stable Production

This season's automobile production is marked by its significant stability.



DETAILS of the "recirculating ball type steering gear" which General Motors will produce for several 1941 cars. Working load efficiencies 100 per cent greater than those obtained from conventional screw and nut type steering gears is reported. The balls fit in a groove between the worm and nut with a return tube to guide the balls into the passageway. The reciprocating motion of the nut is converted into the desired rotary motion of the pitman-arm shaft by rack teeth which are cut on the nut to mesh with pinion teeth.

THE BULL OF THE WOODS — BY J. R. WILLIAMS



An almost unwavering line marks the curve of production since the first of the year. Last week a moderate seasonal climb upped the total to 105,720 units, a level likely to be maintained, according to Ward's Automotive Reports. The increase over the previous week's 103,560 was considered purely nominal but was attributed to an increase in one plant's schedule where a day was added to the working week. In contrast, production for the corresponding week of last year was only 86,725; and there is a striking difference between current production and the 1938 level of about 57,000 at this season of the year.

Major manufacturers made little changes in operating levels. Chrysler output totaled 25,310 against 23,365 in the previous week. The Plymouth division adjusted its schedule upward from 10,550 to 11,200. General Motors held steady at 45,730, compared with 45,772 in the previous week. Chevrolet output was unchanged at 27,000. Ford-Mercury output was 20,825 com-

pared with 21,000 a week earlier, and Lincoln-Zephyr was steady at 600.

An indication of how the smaller manufacturers of automobiles are weathering the winter comes from Hudson. With the 1940 model season only half over, Hudson's domestic shipments are already 11,900 cars ahead of the entire 1939 season.

Some companies are already in sight of their 1940-model goal. Oldsmobile is one of them, having proclaimed the fact that it is now anticipating the establishment of an all-time sales record.

An over-all picture of General Motors operations this winter is given in a recent report of sales made by all the General Motors units in the United States and Canada, including export shipments. Less-than-seasonal declines were shown through December, January and February, as shown here:

	1940 Models	Decline	1939 Models	Decline
December ..	207,637		172,669	
January ...	181,088	15.9%	136,489	22½%
February ..	174,572		133,511	

Machine Tool Dealers Plan Spring Meeting

THE spring meeting of the Associated Machine Tool Dealers of America will be held at the Claridge Hotel, Atlantic City, N. J., May 13 and 14.

Selected from the Philadelphia machinery distributers, the program committee comprises E. W. Lafferty, Swind Machinery Co., chairman; C. F. Pearson and C. C. Brogan, W. E. Shipley Machinery Co.; C. M. Hamersly, Calco Machinery Co.; G. B. McClennen, Delta Equipment Co.; Albert Hepworth, Albert Hepworth Co.; N. P. Lloyd, Lloyd & Arms, Inc.; E. M. Wagner, Vandyck Churchill Co.; and E. A. Lynch, Edward A. Lynch Machinery Co.

John Sauer, Jr., secretary, Peninsular Machinery Co., Detroit, is president of the association, and Thomas A. Fernley, Jr., 505 Arch Street, Philadelphia, is executive secretary.

Machine Tools at 92.9%

CLEVELAND—February operating activity of the machine tool industry stood at 92.9 per cent of capacity compared to 93.3 per cent in January, and 93.3 per cent for December, 1939, according to the latest report of the National Machine Tool Builders' Association, Cleveland.

THIS WEEK IN WASHINGTON

. . . Changes in NLRB personnel considered likely with little change in Wagner Act . . . Walsh-Healey Law today lacks majority support . . . Administration may revitalize PWA before election.

o o o

By L. W. MOFFETT
The Iron Age

o o o

WASHINGTON — Predictions are being made rather freely that the upshot of the drive against the National Labor Relations Act will see no great changes in the law at the present session of Congress. But a new board or a partially new board and a changed procedure may result. This being so the legislation would be inadequate for that large body of business which insists that the law should be widely revised by giving to employers the same protection that it gives to employees.

On the other hand, a change in the board and its procedure undoubtedly would go a considerable way in response to complaints that one of the great difficulties with labor relations is administration of the law by a board whose majority has been charged with extreme bias in favor of organized labor, particularly the CIO. The newest board member, William M. Leiserson, has escaped allegations of partiality as between CIO and AFL and frequently is at loggerheads with his two colleagues, Chairman J. Warren Madden and Edwin S. Smith. It is commonly thought that if the board were reorganized Mr. Leiserson would remain as a member but that if their names were again sent to the Senate, Mr. Madden and Mr. Smith would not be confirmed.

Opposed to Revision

The suggestion that appears to have the most substance, however, is that the board be increased by two members in order to give Mr. Leiserson two associates to form a majority in order to change board procedure. Mr. Leiserson is opposed to revision of the act but is a strong critic of its administration. He insists that there is necessity for changes in administration, procedure and personnel.

While President Roosevelt has not gone on record publicly respecting changes in the Wagner act and its administration, it is widely accepted that he is opposed to any basic revision of the law. But revelations of maladministration of the Wagner act, as disclosed by the Smith House Committee investigating the board, have developed such pressure for a house cleaning that the Administration is said to be prepared to yield to certain modifications both as to the act and its administration. This is indicated by a Senate speech of Senator Wagner, author of the present law, who often reflects the White House view, notably on labor legislation. Though he vigorously attacked the proposed amendments offered by the majority of the Smith Committee, Senator Wagner said he would not object to increasing the board membership from three to five. Mrs. Mary T. Norton, Democrat of New Jersey, Chairman of the House Committee on Labor, indicated that she also was agreeable to such a change. She made the observation following a conference with President Roosevelt with whom she had a lengthy discussion regarding changes in the Wagner act.

Some Amendments Constructive

Increasing chances of limited changes in the law was the statement of William Green, president, the American Federation of Labor, that some of the Smith Committee amendments "are practical and constructive." But, as an overall picture, Mr. Green said that amendments "as a whole strike in a destructive way at vital, fundamental principles of the act." Reflecting a split within the federation's own ranks respecting the Smith amendments, its International Association of Machinists, through H. W. Brown, president, flatly condemned them. He charged that they "would nullify labor's rights and curb the power of the board to act in labor's behalf." This organization thus takes a stand similar to that of the CIO, Senator Wagner and other critics of the amendments. Mr. Green, long hostile to the board, wants a change in its organization and procedure as well as certain revisions of the act, one of which, providing for the right of employers to petition for elections, has been persistently urged by business interests.

Specifically Mr. Green said the AFL will petition and appeal to Congress for amendments providing for a reconstruction of the labor board; the right of employers to petition for elections under certain conditions; the abolition of the right of the board to invalidate contracts honestly and justly negotiated through collective bargaining; the acceptance of the American Federation of Labor recommendations relating to the selection and establishment of the appropriate collective bargaining unit, and the acceptance of a simplified form of administrative and judicial procedure.

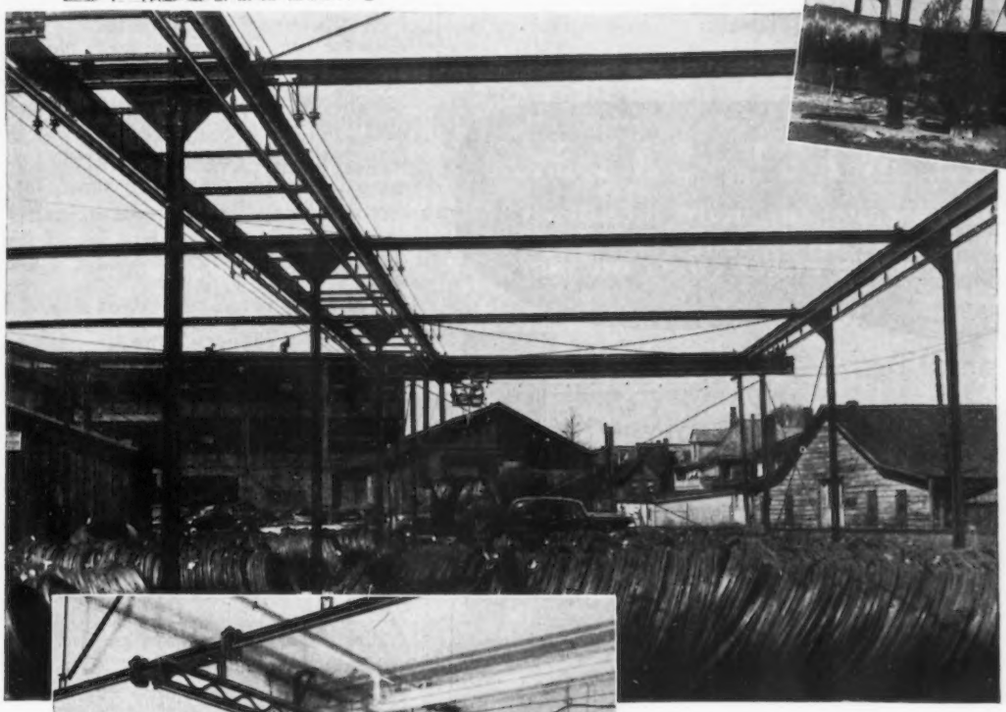
Short-Circuit Planned

Soon after Mrs. Norton's White House visit the House Labor Committee, by a vote of 17 to 1, agreed to end long drawn out hearings, which, it is charged, were held chiefly to stall off legislation to revise the Wagner law. Its hands forced, the committee now has begun sessions behind closed doors, and according to Mrs. Norton, the committee "will report something." Desirous of short-circuiting the Smith amendments, if possible, it is the plan of the majority of the House Labor Committee to report a bill of its own to replace any pending amendments.

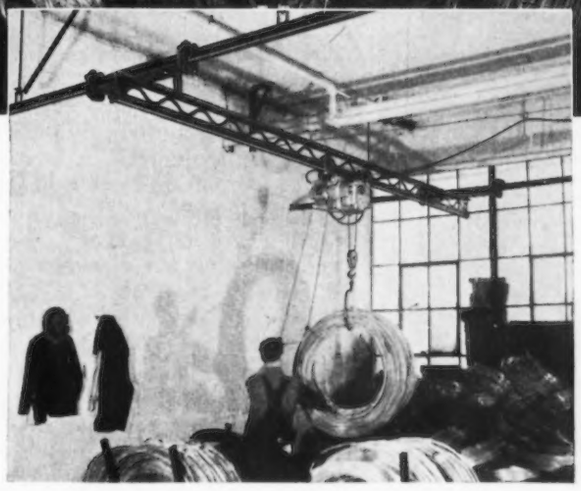
Even Senator Wagner, who said the Smith amendments would "more than repeal the labor act" conceded that the Smith House Committee provided evidence "about conduct of some members of the staff of the National Labor Relations Board, which is highly undesirable." He especially condemned what he called "destructive" defini-

"Saves 32c per ton!" in handling cost - - -

Two men unload car of rod in 1½ hours with crane and electric hoist.



Cranes provide 6000 sq. ft. of low-cost storage area served by electric hoists



Light duty crane reduces inside storage area. Hoist conveys coils to punches and cold-headers.

Unloading and storing coiled rod from box cars formerly cost 40c per ton and required 5500 sq. ft. of warehouse space.

Now, raw coils are unloaded from gondolas, stored outside and handled through pickling to punches and cold-headers at 8c per ton.

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tions of collective bargaining as set forth in the Smith Committee proposals. Senator Wagner's and Mrs. Norton's opposition to any fundamental change in the law is shared by Senator Elbert D. Thomas, Democrat, of Utah, Chairman of the Senate Committee on Education and Labor.

Propose an Administrator

Despite claims that the Smith Committee has offered "ripper" amendments to the Wagner act the fact is that they do not alter the fundamental principle of the present law though they do provide profound changes for its operation and administration. One outstanding proposal which would meet employer contention that the board acts as judge, juror and prosecutor would segregate these processes. The Smith bill proposes to establish the office of "administrator" who would prosecute cases and a separate labor board which would hear and pass upon them.

Commenting on this proposal, Senator Wagner said:

"Such a dismemberment of functions and division of responsibility would defeat the just expectation of industry and labor that there be prompt and effective administration of the national labor policy," he declared. "There would be nothing to prevent the administrator from adjusting cases on a basis entirely different from those laid down in the board's decision, or from refusing arbitrarily to issue a complaint in a case clearly within the board's province.

"The division of responsibility and confusion of policy reach farcical heights in the proposals that the administrator, not the board, should direct and control litigation in the courts for enforcement of orders issued by the board."

Merry-go-round for Workmen

Senator Wagner, however, strikes at all the procedural changes. He broke out with the charge that they would provide "a feast for a few lawyers, an insuperable problem for the courts, an insurmountable obstacle to any efficient administration of the law, a blessing to those anxious to disobey the law and a merry-go-round for the employers and workers affected by the law."

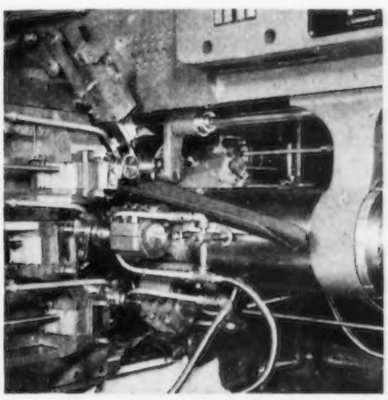
The proposal that back pay awards be limited to six months was met with the declaration that it "would make the wrongfully discharged worker bear the burden of inevitable delays of legal process" while encouraging dilatory tactics by employers "with greater economic staying power." Fixing a six-month statute of limitations for filing charges, the Senator said, "would cause employees, in self-protection, to file charges on the slightest provocation. He added that it was "repugnant" to him that "a man of property should have 20 years to protect his holdings by recourse to law, while the wronged worker would be denied the right to regain his job after six months.

Denial of reinstatement of an employee who engaged in violence brought from the New York Senator the light remark that he was unable to believe that as a matter of inflexible Federal law "a man should lose all right to earn his bread because of a minor scuffle on the picket line, which may well already have been punished under local law."

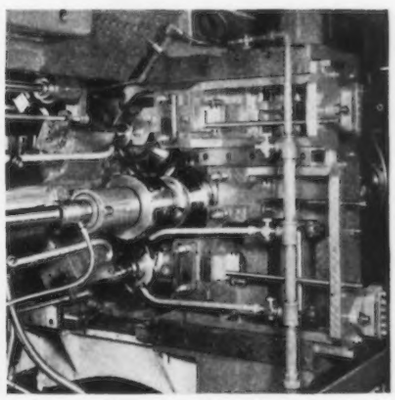
The "free speech" amendment was branded as an effort to overrule decisions of the Supreme Court and thus to allow unfair practices which the

Making the Smoke Fly

THE 3½" six-spindle Conomatic was recently used for making ash trays from bar stock as a demonstration job to show the application of this machine to several types of difficult machining operations. In the fourth position a milling attachment was used for milling out the four slots on the top of the tray. In the fifth position a stamping attachment was used to stamp the name and address around the edge in one revolution of the work. Note the deep forming cuts used on the under side and base. These ash trays were produced in 2 minutes each — that's making the smoke fly! Your own jobs may not include the type of operations needed to produce this ash tray, but here is the proof that the 6-spindle Conomatic is built to handle the tough jobs along with the easy — both with savings that will look attractive to any progressive manufacturer.

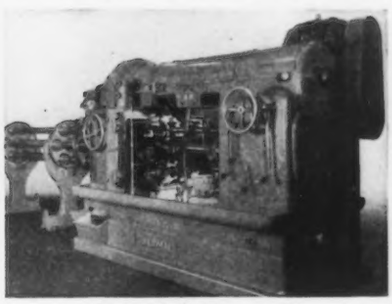


Close-up of tooling, front side of Six-Spindle Conomatic.



Close-up of tooling, back side of machine.

Cone Automatic Chip Remover used on the machine described above.



Six-spindle Conomatic Screw machine.

CONE AUTOMATIC MACHINE CO., INC.
Windsor, Vermont, U. S. A.

court has repeatedly held there is no constitutional right to enjoy. Senator Wagner said the amendment would undo the substantial justice embodied in many Supreme Court decisions and open the way for the return of company-dominated unions.

Would Increase Costs

Opposing the amendment to have rules of evidence in Federal district courts applied to labor board procedure, Senator Wagner declared that the change would burden everybody with the cost of time of new litigation on purely technical points. The amendment to permit the courts to reverse the board's finding of facts, the Senator said, would require the reviewing court to weigh the evidence and substitute its judgment on the facts for those of the board.

Should a preliminary investigation substantiate a charge an employer would be served with a complaint setting forth not only the charge but also the redress expected if the board found him guilty. At present the employer is not advised of redress now expected of him but under the proposed amendments the employer would be put on notice to reinstate a dismissed employee and amount of wages to be paid because of illegal dismissal. However, unlike the present law under which an employer frequently is required to pay back wages for two or even three years before union charges have been filed, liability would be restricted to six months before complaint was made to the board. This provision would protect the employer in contesting the board's decision in courts from accumulating heavy costs for back pay during the time while the case was in the courts. Also unlike the present procedure the board could not order reinstatement of an employee whose union activity had included willful violence, destruction of property or participation in a sit-down strike.

Fewer Consumers Roll Steel Solely for Own Use

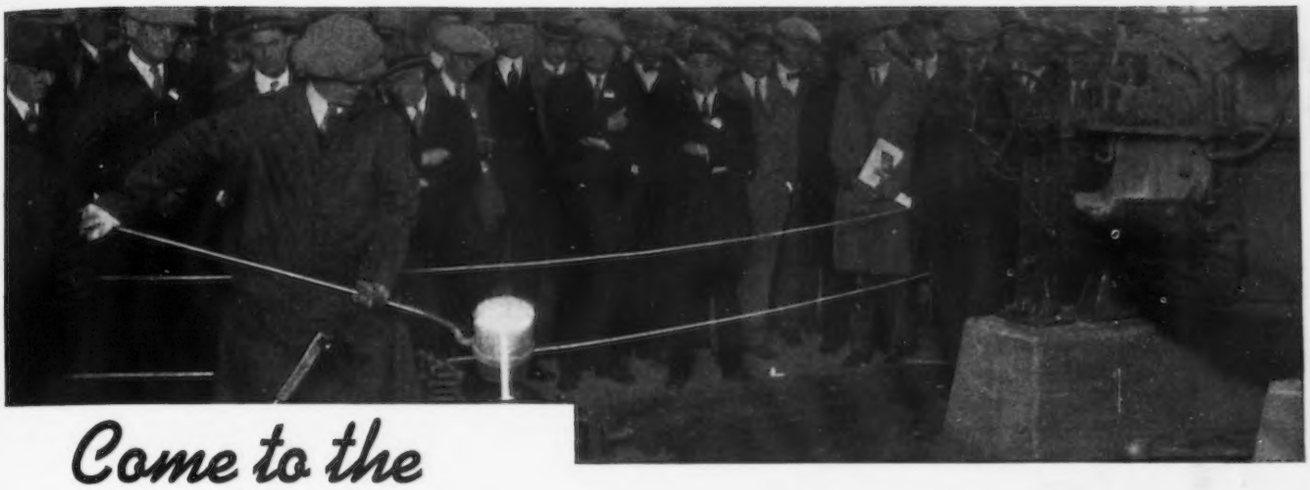
IN 1916 there were 380 rolling mill plants in the U. S., of which 58 were operated by consumers of steel solely for their own use, according to the American Iron and Steel Institute. Today only 14 of the nation's 375 rolling mill plants are operated by steel consumers exclusively for the purpose of supplying some part of their steel requirements.

Dow to Build $5,000,000 Plant for Magnesium

MIDLAND, Mich.—Dow Chemical Co. will start construction immediately at Freeport, Tex., to erect a $5,000,000 plant for production of magnesium. An 800-acre tract with three miles of harbor frontage was purchased recently. The plant will use sea water as a source for the magnesium metal. It will more than double Dow's capacity for magnesium production.

Armor Plate Buying Revised

WASHINGTON—The purchase of armor plate, ballistic steel, special treatment steel, etc., used as part of the hull structure of naval vessels, has been transferred to the jurisdiction of the Bureau of Construction and Repair from the Bureau of Ordnance by order of Secretary of the Navy Charles Edison. Proof testing will remain under the supervision of the Bureau of Ordnance.



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Administration, With Election Near, May Revitalize PWA

WASHINGTON — Remindful that 1940 is an election year and unwilling to risk the possibility of a business decline the Administration showed signs this week of attempting to revitalize the Federal works and relief programs which have been tapering off drastically during the past year.

Forerunner of a revived PWA program many believed, was the White House-indorsed $10,000,000 hospital construction bill sponsored by Senator Robert F. Wagner Democrat of New York. The measure introduced in Congress early in February after President Roosevelt sent a special message to Congress recommending a national health program calls for a construction program under the direction of the Federal Works Agency for hospitals the title to which would be vested in the Federal Government.

By itself the measure when introduced did not suggest a large-scale attempt to revive the Federal works program, but more recently Senator Wagner is understood to have told Senate colleagues that he is willing to incorporate in his bill a proposal by Senator James M. Mead, Democrat of New York, under which a $300,000,000 construction program would be launched by the Federal Works Agency, of which PWA is a subdivision.

Hopes for Composite Bill

In line with the Administration's disposition to favor "self-liquidating" loans in lieu of Treasury grants, as indicated by the New Deal's unsuccessful $2,500,000,000 spend-lend proposal advanced last summer, the Mead bill proposes long-term loans at 2 per cent interest but limits construction to hospitals, water and sewerage systems—projects which constituted about 20 per cent of the 1938 PWA projects. But despite these restrictive features, there are indications that Federal Works Administrator John M. Carmody is relying heavily on a composite bill, combining the features of both the Wagner and Mead measures, to inject new life into his dwindling PWA dynasty. Although both measures have been drawn under a guise of health security programs. Mr. Carmody is hopeful that Congress can be sold on the idea of developing and broadening the bills into a promising 1940 version of the spend-lend scheme.

The Federal Works Administrator last week released a report in which he praised the merits of the PWA program, pointing out that since June, 1933, some 34,469 Federal and non-Federal projects have cost $5,985,309,535, of which $38,939,369 a month has gone into the pockets of American business.

Near a Standstill

The 1938 PWA program is now 86 per cent completed, with 5318 of the 6166 projects already in use. The remainder of the projects will be substantially completed within the next four months, Mr. Carmody said. This means, although Mr. Carmody didn't say so in as many words, that unless Congress appropriates more money, the whole scheme of public works will come to a complete standstill.

"The demand by American communities for more public improve-

(Advertisement)

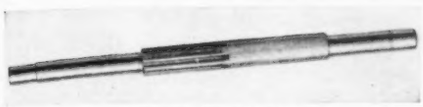
Stressproof News

T. M. REG. U. S. PAT. OFF.

Presenting News of a New Cold Finished Steel Bar

EXTRA! Several manufacturers report that slight changes in design of parts to permit use of STRESSPROOF No. 2 have made possible replacement of more expensive heat treated alloys formally used. Large savings in costs reported.

By LA SALLE STEEL COMPANY — **Chicago, Illinois**



STARTER SHAFT
STRESSPROOF Replaces SAE 1045

UPS MACHINING RATES ON STARTER SHAFTS 38%

Maker Reduces Production Costs on Shafts Over 5c Per Part

A prominent manufacturer of shafts some time ago surveyed the field for a steel bar that could be machined into quality parts at higher speeds than the SAE 1045 then being used in the plant. Test runs on STRESSPROOF No. 2 Cold Finished Steel Bars, he says, gave ample proof that this steel was equal to his demands. Its superior machinability was responsible for an increase of 38% in machining speeds, and similar increases in tool life—advantages that alone indicated a welcome cut in production costs.

A check on other required qualities for the use in question resulted in further evidence that STRESSPROOF No. 2 was the ideal steel for the part. Tests on the finished parts showed the STRESSPROOF shaft to have higher torque values than the shaft made from SAE 1045 and heat treated after machining to equivalent hardness.

In addition, the use of STRESSPROOF No. 2 eliminated all necessity for heat treating; the excessive warpage experienced with SAE 1045 was reduced to a minimum; straightening was eliminated, and rejections were considerably reduced. All in all, costs were reduced over 5 cents per shaft.

User Defines New Bar Steel As One With *All* Desired Qualities

Contrasts STRESSPROOF With Steel Offering Perfection In One Quality but Sacrificing All Others

At a recent small get-together of men identified in one way or another with the manufacture of various types of steel parts, the conversation naturally revolved about a discussion of the various grades of steel bars available to industry today. Out of that discussion came a particularly apt definition of STRESSPROOF No. 2, one of the newest of the cold finished steel bars. The man who offered the definition spoke out of personal experience with this and a great many other grades of steel bars. What he said may be summed as follows:

"In the main, there are four distinct qualities in steel, all of them highly desirable. They are (1) strength, (2) freedom from warpage, (3) machinability, and, (4) wearability.

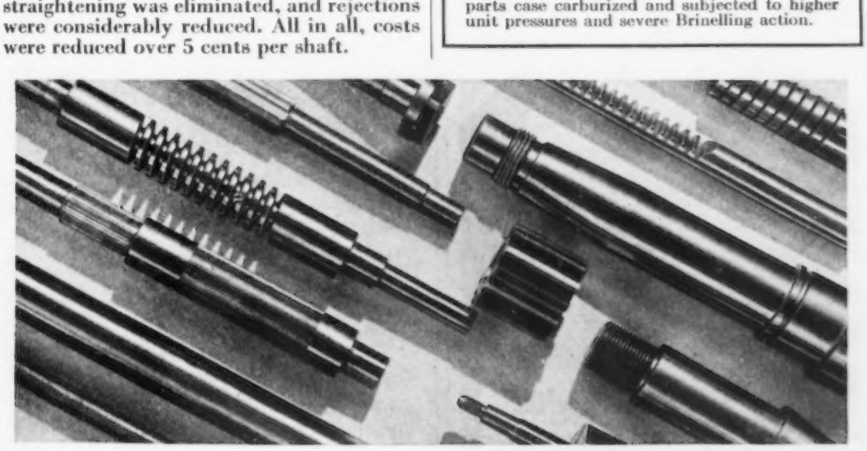
"I would describe STRESSPROOF as a steel in which all these desirable qualities have been retained. Although there has been a slight sacrifice in maximums, not one of the desirable qualities has been eliminated. Other steels may offer perfection in one quality, but at a complete sacrifice of one or more of the other desirable qualities."

When Not to Use STRESSPROOF No. 2

STRESSPROOF No. 2 by reason of its unique wearing qualities can be substituted for case carburized steel in many applications. It should be noted, however, that STRESSPROOF No. 2 has a Yield Strength of 100,000 lbs. p.s.i. minimum, and, therefore, is not suitable for parts case carburized and subjected to higher unit pressures and severe Brinelling action.

That definition is one which finds the metallurgists of the La Salle Steel Company in complete agreement. For it describes their sole aim during the many years spent in developing the exclusive STRESSPROOFING process. This is a process which imparts to cold finished steel bars sufficient strength and wearability to meet the requirements of a vast range of applications, in combination with a high degree of machinability and minimum warpage. No longer is it necessary to suffer the poor machinability and constant warpage of heat treating or carburizing steels in order to obtain strength or wearability necessary for many applications; or to lose satisfactory carburizing and heat treating properties in order to gain free machinability through the use of a screw steel; or to use annealing treatments in an attempt to solve the warpage problem. With STRESSPROOF, qualities formerly sought by heat treating, carburizing, or annealing; or by using heat treated bars; or by using free machining steels are now obtainable in a single grade of steel in sufficient proportions to satisfy hundreds of applications.

The practical result has been to lower materially the cost of finished parts through elimination of various processing stages formerly necessary, and to simplify greatly the purchase and stocking of cold finished steel bars. For STRESSPROOF No. 2 has replaced such steels as Case Carburized SAE X-1315, X-1020, and 4615; Heat Treated SAE 1045, 3135, 3140 and 4140, and other analyses with complete success from the standpoint of reliable service in use as well as economy of production costs.



Above is a grouping of a few of the hundreds of parts being produced at lower costs with STRESSPROOF No. 2. Among the manufacturers currently using this new cold finished steel bar are makers of machine tools, automotive parts, farm equipment, miscellaneous machinery, washing machines, stokers, pumps, speed reducers, motors, engines, and scores of others.

La Salle STEEL

La Salle STEEL COMPANY

Manufacturers of the Most Complete Line of Cold Finished Steel Bars in America

Address: Dept. 3D, Box 6800-A
CHICAGO, ILLINOIS

ments was evidenced in the fact that when the 1938 PWA funds for allotments were exhausted, there were still on hand 5043 applications filed by public bodies," Mr. Carmody said. "These applications calling for a total estimated cost of more than $1,700,000,000 were returned without Federal allotments to the public bodies last September. Included in these applications were 314 for sewer systems, 467 for waterworks systems, 2083 for schools and 203 for hospitals. It is to be hoped that the impetus given by the Federal Government to these needed public improvements will not be lost and that the communities affected will carry on under their own power."

Of course, the New Deal argument is that there are 5043 applicants or more who cannot carry on "under their own power" and who are acutely in need of Federal loans. If key New Dealers feel that the time is ripe to let another spend-lend offensive out of the box, there are signs that many members in Congress, particularly those who are up for reelection this year, would find it difficult to vote against the move.

Champion of Economy

Indeed, to many in Congress the program would be a godsend. Because Treasury grants would not be involved, Congressional advocates of such a plan would not run the risk of bearing the spendthrift label. It is doubtful that the White House, which is belatedly trying also to set itself up as a rigid champion of economy would attempt to sell Congress on a program based on the 45-per-cent-grant-55-per-cent-loan basis. For months, PWA opponents on Capitol Hill have been expecting a move to revive the grant-loan program and have been prepared to show that more than 300 municipal and county bond issues, purchased by PWA to finance the applicants' share of such projects and representing an aggregate principal sum of $42,000,000 are in default.

Hillside Fluor Spar to Drill Untested Properties

HILLSIDE FLUOR SPAR MINES, 38 South Dearborn Street, Chicago, plans during 1940 to drill untested areas of its properties in an effort to meet conditions created by the European War, G. H. Jones, president, announces. While the war lasts fluor spar imports cannot fill out an inadequate supply of American fluor spar and the domestic supply probably will not be sufficient to take care of all requirements under full operations by steel plants using fluor spar, Mr. Jones said.

Government Awards

WASHINGTON — Government awards for iron and steel products, as reported for the week ended March 9 by the Labor Department's Public Contracts Division, totaled $561,281. Contracts reported for nonferrous metals and alloys for the same period were $135,278, and for machinery, $1,265,843. Details follow:

Iron and Steel Products

Apollo Steel Co., Apollo, Pa., Norfolk Navy Yard, steel, sheet	$15,500
General Cable Corp., Philadelphia, Norfolk Navy Yard, cable	14,674
Aero Supply Mfg. Co., Inc., Corry, Pa., War Air Corps, bolts	16,315
Allegheny Ludlum Steel Corp., Pittsburgh, War Ordnance, strip steel	69,646
Continental Roll & Steel Foundry Co., East Chicago, Ind., War Ordnance, steel castings	11,457
Noland Co., Inc., Washington, D. C., War QMC, plumbing supplies	29,683
Jamestown Steel Partitions, Inc., Jamestown, N. Y., Naval Air Station, steel partitions	23,570
The Henkel Co., Fremont, Ohio, Navy S & A, steel shears	20,129
Utica Drop Forge & Tool Corp., Utica, N. Y., Navy S & A, nippers and pliers	14,321
Pressed Steel Tank Co., West Allis, Wis., Navy S & A, shells, bronze, steel	14,039
Crucible Steel Co. of America, New York City, Navy S & A, steel, tool	32,577
Central Iron & Steel Co., Harrisburg, Pa., Navy S & A, steel plate	14,250
Pittsburgh Screw and Bolt Corp., Pittsburgh, Navy S & A, rivets, steel	19,950
Bethlehem Steel Co., San Francisco, Cal., Navy S & A, steel, bar	11,775
Bethlehem Steel Co., Bethlehem, Pa., Navy S & A, steel, bar	14,028
Walter Kidde & Co., Inc., New York Central, Navy S & A, cylinders, steel	20,184
American Chain & Cable Co., Inc., American Cable Division, Wilkes-Barre, Pa., Navy S & A, hawsers, wire	15,564
Foster Wheeler Corp., New York City, Navy S & A, boilers	32,104
The Youngstown Sheet & Tube Co., Youngstown, Ohio, Navy S & A, steel, nickel, bar	24,558
Merco Nordstrom Valve Co., Pittsburgh, Navy S & A, cocks, plugs	12,518
Northill Company, Inc., Los Angeles, Navy S & A, anchors, folding	41,864
Jessop Steel Co., Washington, Pa., Navy S & A, steel, sheets	12,179
Sharon Steel Corp., Sharon, Pa., Navy S & A, steel, corrosion	13,742
Belt & Nut Division, Republic Steel Corp., Cleveland, Navy S & A, bolts and nuts	13,225
United States Pipe & Foundry Co., Philadelphia, Panama Canal, pipe, cast-iron	11,820
Judson Steel Corp., Oakland, Cal., WPA, reinforcing steel	12,700
Reeves Steel and Mfg. Co., Dover, Ohio, War QMC, galvanized cans	28,900

Non-Ferrous Metals and Alloys

The New Jersey Zinc Sales Co., Inc., New York City, Navy S & A, zinc, sheet	$11,940
C-O-Two Fire Equipment Co., Newark, N. J., Navy S & A, extinguishers, fire	40,331
The International Nickel Co., New York City, Navy S & A, nickel, copper-alloy	13,909
U. S. Bronze Powder Works, Inc., New York City, Navy S & A, pigment, aluminum	12,089
Aluminum Co. of America, Washington, D. C., Navy S & A, pigment, aluminum	13,103
Aluminum Co. of America, Atlanta, TVA, conductor	17,305
Mueller Brass Co., Port Huron, Mich., War Ordnance, brass forgings	26,600

Machinery

The Hendey Machine Co., Torrington, Conn., War Ordnance, lathes	$15,040
Gisholt Machine Co., Madison, Wis., War Ordnance, turret lathes	14,655
Wright Mfg. Div. of American Chain	

& Cable Co., Inc., York, Pa., War QMC, hoists 14,834
Kellogg Division of the American Brake Shoe & Foundry Co., Rochester, N. Y., War QMC, compressors. 16,132
Koehring Co. & Associates, New York City, War QMC, construction equipment and machinery 46,182
The Paving Supply & Equipment Co., Washington, D. C., War QMC, construction equipment and machinery 58,276
Ingersoll-Rand Co., Washington, D. C., War QMC, air compressors, wagon drills 11,236
Worthington Pump and Machinery Corp., Washington, D. C., War QMC, air compressors 27,715
Bay City Shovels, Inc., Bay City, Mich., War QMC, power shovels .. 117,962
Caterpillar Tractor Co., Peoria, Ill., War QMC, tractors, motor graders. 285,125
The Galion Iron Works and Mfg. Co., Galion, Ohio, War QMC, road rollers 11,931
The Cleveland Trencher Co., Cleveland, War QMC, trench excavators. 12,462
Commercial Iron Works, Portland, Ore., Interior Reclamation, butterfly valves 26,491
Lakeside Bridge & Steel Co., Milwaukee, TVA, lifting towers and machinery 42,620
Pangborn Corp., Hagerstown, Md., War Air Corps, sand blast unit cabinets 15,095
Bay City Shovels, Inc., Bay City, Mich., War QMC, power shovels ... 24,000
The Galion Iron Works & Mfg. Co., Galion, Ohio, War QMC, construction equipment and machinery 10,920
Northwest Engineering Co., Chicago, Interior Reclamation, dragline excavators 29,800
Smith-Courtney Co., Richmond, Va., Navy S & A, boring machine 15,370
Northern Pump Co., Minneapolis, Navy S & A, portable pumps 65,848
Cincinnati Milling Machine & Cincinnati Grinders, Inc., Cincinnati, Navy S & A, milling machines 19,418
Buffalo Pumps, Inc., Buffalo, N. Y., Navy S & A, centrifugal pumps .. 13,080
Clyde Iron Works, Inc., Duluth, Navy S & A, winches 12,048
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., Navy S & A, hydraulic press 10,773
Pennsylvania Pump & Compressor Co., Easton, Pa., Navy S & A, centrifugal pumps 10,724
Machinery Builders, Inc., Long Island City, N. Y., Navy S & A, towing carriage 114,812
Struthers Wells-Titusville Corp., Titusville, Pa., Navy S & A, windlasses 113,124
The Ohio Injector Co., Philadelphia, Procurement, valves .....Indefinite
Brown & Sharpe Mfg. Co., Providence, War Ordnance, milling machines .. 15,923
W. E. Shipley Machinery Co., Philadelphia, War Ordnance, gear hobber 12,200
Kearney & Trecker Corp., Milwaukee, War Ordnance, milling machines.. 53,548
Farrel-Birmingham Co., Inc., Buffalo, N. Y., War Ordnance, finish machining 10,530
The Sebastian Lathe Co., Cincinnati, War QMC, lathes 17,963

Navy Contracts

WASHINGTON—The Navy Department's Bureau of Supplies and Accounts last week awarded contracts to the following companies:

Buffalo Forge Co., Buffalo, ventilation equipment, $48,180; R. K. LeBlond Machine Tool Co., heavy duty lathe, $30,041; Rockford Machine Tool Co., Rockford, Ill., shaper-planer, $11,810; Magnaflux Corp., Chicago, magnetic inspection equipment, $10,695; Walworth Co., New York, valves, $45,013; Seaboard Brass & Copper Co., Baltimore, valves, $19,134; Lloyd & Arms, Inc., Philadelphia, honing machine, $8,883.

Tidewater Supply Co., Inc., Norfolk, Va., turret lathe, $10,019; Smith-Courtney Co., Richmond, Va., cylindrical grinder, $10,209; Babcock & Wilcox Co., Beaver Falls, Pa., steel tubing, $8,983; Bethlehem Steel Co., Bethlehem, Pa., nickel steel, $22,729; Burke Electric Co., Erie, Pa., motor generators, $12,230; Lodge & Shipley Machine Tool Co., Cincinnati, engine lathes, $37,922; Smith-Courtney Co., Richmond, Va., shapers, $16,018.

The Bullard Co., Bridgeport, Conn., turret lathe, $13,511; General Motors Corp., Harrison Radiator Division, Lockport, N. Y., core assemblies, $6,698; Brown & Sharpe Mfg. Co., Providence, high speed screw machine, $5,285; Vandyck Churchill Co., Philadelphia, milling machine, $6,763; Whaley Engineering Corp., Norfolk, Va., bomb and torpedo trucks, $26,950; Lewis-Shepard Co., Watertown, Mass., torpedo skids, $11,118; Boye & Emmes Machine Tool Co., Cincinnati, engine lathe, $8,573.

Pratt & Whitney Division, Niles-Bement-Pond Co., West Hartford, Conn., vertical shaper, $6,717; Mine Safety Appliances Co., Pittsburgh, eye and nose protectors, submarine escape apparatus, $9,990; E. Schwartz Plumbing Supply Co., Inc., New York, pipe fittings and plugs, $5,331; W. E. Shipley Machinery Co., Philadelphia, precision lathes, $6,392; Henry Prentiss & Co., Inc., New York City, turret lathes, $17,739.

Cooper-Bessemer Corp., Washington, marine engine, $24,459; Cincinnati Shaper Co., Cincinnati, squaring shear, $6,215; Atlantic Screw Works, Inc., Hartford, Conn., wood screws, $11,917; Pheoll Mfg. Co., Chicago, machine screws, $8,023; H. F. Allen Co., Inc., New York, slotter machine, $7,637.

Walsh-Healey Act Now Lacks Support of Congress Majority

WASHINGTON — The Walsh-Healey Public Contracts Act, which was passed by Congress in June, 1936, as a result of the "emergency" created by the collapse of minimum wage standards under the Blue Eagle, probably could not be reenacted if such a vote were taken in Congress today. Passage of the Fair Labor Standards Act in July, 1938, makes the public contracts law difficult to justify, yet, because it is already on the statute books, its repeal is not likely.

On the contrary, the Secretary of Labor and her administrative officials, the CIO and the AFL, are actively pushing a proposal in Congress to broaden the scope of the Walsh-Healey Act. They want to lower the contract limit so that employers holding Government contracts valued at $2,000 or more will be covered by the law. They want to broaden coverage so that subcontractors are brought under its provisions, so that all Government shipbuilding contracts are included, and so that firms found guilty of violating the Wagner Act will be blacklisted and prohibited from receiving Government contracts.

Luken's Case Pending

The Labor Department's Public Contracts Division, administrative agency created by the Walsh-Healey Public Contracts Act, has a notoriously poor enforcement record, according to data submitted to Congressional committees. Moreover, the division is moving to broaden its activities while pending in the Supreme Court is a case which, if decided adverse to the Government, would produce an immediate collapse of all wage determinations thus far made under the law.

Coming up for argument before the high tribunal next week, the Lukens Steel case is the first court test involving the Public Contracts Act. Joining with the Lukens Steel Co., of Coatesville, Pa., are six other small independent Eastern mills whose complaint is that the Secretary of Labor exceeded her authority under the law in attempting to subject steel mills in the East to a 62½c. minimum wage. This view was upheld last October by the Court of Appeals for the District of Columbia. The majority decision delivered an outspokenly bitter attack on the Secretary of Labor, declaring that in her steel wage determination her interpretation of the word "locality" represented a grossly unwarranted attempt to read into the law something which Congress never intended.

Fall Into Disuse?

The Court of Appeals placed such a restriction on the word "locality"—heart of all wage determinations made under the law—that if the view is sustained by the Supreme Court, the entire Walsh-Healey wage structure admittedly would collapse. In such an eventuality, the law would probably not be repealed but rather would fall into disuse.

But despite this cloud overhead, the Public Contracts Division has not slowed its pace. Confident that the Government's steel wage determination will not be invalidated by the high court, the division is asking Congress for more power on the one hand, and

moving to encompass more industries under the present law on the other.

Only last week, the division called in representatives of the boiler shop products and steel plate fabricating industries who have agreed at the request of Administrator L. Metcalfe Walling to collect wage data on which a minimum wage determination will be made—probably in the next two months. At the conference were Tom R. Wyles, executive director of the Steel Plate Fabricators Association; H. E. Aldrich, secretary, Boiler Manufacturing and Associated Industries and the American Boiler Makers; J. E. Julian, president, National Truck Tank Association; Harold J. Ruttenburg, research director, Steel Workers Organizing Committee, CIO affiliate, and H. W. Boone, of the AFL's International Association of Machinists. Officials of the division said that preliminary steps had been taken, not at the request of labor groups, but on the division's own motion.

A sub-division of the House Judiciary Committee last week concluded public hearings on three pending bills designed to broaden the Walsh-Healey Act along the lines desired by the Labor Department, the CIO and the AFL. Despite optimism reflected by Secretary of Labor Perkins and her associates, who have been trying to broaden the law's scope ever since it found a place on the statute books, it is regarded as doubtful that the full committee will vote to report favorably on the proposals.

The poor enforcement record under the present law, the regulation of minimum wages under the wage-hour law, opposition from employers and from the War and Navy Departments are factors which can be expected to turn the tide against the bills.

Orders for Army

WASHINGTON—The War Department made awards to these companies during the two-week period ended Feb. 29:

Van Dyck Churchill Co., New York, universal milling machines, $6,243; Neff Kohlbusch & Bissell, Inc., Chicago, surface grinding machine, $1,075; Leeds & Northrup Co., Philadelphia, electric hardening furnace, $3,443; Hendey Machine Co., Torrington, Conn., motor-driven geared head lathes, $15,040; The Thompson Grinder Co., Springfield, Ohio, semi-automatic broach sharpener, $5,450; Buffalo Forge Co., Buffalo, N. Y., bar cutter shear, $4,245.

Jones & Lamson Machine Co., Springfield, Vt., turning lathes, $87,432; Watson-Stillman Co., Roselle, N. J., hydraulic pressure pump, $4,750; Okonite Co., Passaic, N. J., power cable, $7,928; Gallon (Ohio) Iron Works Mfg. Co., road graders, $35,937; Kilby Steel Co., Anniston, Ala., screw posts, $6,971; Steel Products Co., Savannah, Ga., structural steel for temporary housing, $33,395.

Sperry Gyroscope Co., Brooklyn, N. Y., control and pulley assemblies, $98,452; Hayes Industries, Inc., Jackson, Mich., wheel and brake assemblies, $121,343; Goodyear Tire & Rubber Co., Akron, Ohio, wheel and brake assemblies, $74,720; United Aircraft Corp., Pratt & Whitney Aircraft Division, East Hartford, Conn., spare parts for aircraft engines, $272,359; Sterling Engine Co., Buffalo, electric power plants, $80,150.

Peco Mfg. Co., Philadelphia, machining mechanical time fuse bodies and caps, $75,000; Harvey Metal Corp., Chicago, brass forgings for mechanical time fuse, $107,550; American Tube Bending Co., Inc., New Haven, Conn., exhaust manifold for continental engines, $3,665; Continental Motors, Inc., Muskegon, Mich., exhaust manifold, $1,285.

Doehler Die to Expand

TOLEDO—Doehler Die Casting Co. has acquired from the city a strip of property adjoining its plant for expansion purposes. Construction work, however, will be delayed until the city completes installation of a large water main through the area.

Steel Inventories Reported As Increasing 0.3% in January

WASHINGTON—January inventories of iron and steel products increased 0.3 per cent over December accumulations while the latter month showed an increase of 0.7 per cent above those of November, according to the monthly industry survey of manufacturers by the Bureau of Foreign and Domestic Commerce. Inventories of machinery, except electrical, increased 4.8 per cent over December when accumulations rose 3.8 per cent over those of November. Respective gains made by electrical machinery inventories were 4.1 per cent and 5.3 per cent while increases in transportation equipment inventories, except automobiles, were 2.1 per cent and 8.3 per cent. Inventories of automobiles and automobile equipment in January were 0.8 per cent over those in December. Increases in December were 2 per cent over November.

Shipments of iron and steel products in January declined 12.9 per cent in value under last December while in the latter month there was no change from November, but in January, 1940, there was an increase of 41.6 per cent over January, 1939. The decline in steel in January from December was the sharpest made by any of the reporting industries.

Shipments of transportation equipment in January reflected a gain of 3.3 per cent over December while December shipments showed an increase of 3.4 per cent over those of November. January, 1940, showed a gain of 82.9 per cent over January, 1939. Shipments of electrical machinery in January showed a decline of 2.3 per cent under those of December in which month there was a drop of 3.4 per cent under November. There was an increase of 23.5 per cent in January of the present year over January, 1939. Shipments of machinery, except electrical, declined 7.8 per cent in January of the present year under last December when shipments rose 3.1 per cent over November. In January, 1940, there was a gain of 29 per cent over January, 1939. Shipments of automobiles and auto equipment declined 4.4 per cent in January of the current year under December while December shipments showed an increase of 1.9 per cent over November. There was a gain of 30.3 per cent in January, 1940, over January, 1939.

The value of inventories for both the non-durable and the durable goods which were surveyed showed an increase of 2.5 per cent in January over December as compared with successive increases of 3 per cent both in November and December. Data were reported by 551 companies whose inventories were said to have amounted to $3,250,000,000 at the end of January, or more than one-fourth of the stocks held by all manufacturing corporations.

The report said that the decline in the aggregate of new orders in the durable goods groups was largely traceable to the smaller volume of incoming business in the iron and steel and transportation equipment industries which showed decreases from December to January of one-fourth and one-fifth respectively. On the other hand the machinery group showed January orders totaling approximately 12 per cent more in dollar volume than was received in December.

Check New Deal Bureaucracy to Bring Recovery, Girdler Urges

BUSINESS must be freed of Government red tape to get this country off a "dead center," Tom M. Girdler last week told the Boston Chamber of Commerce in an attack on what he called "bureaucracy and government control over enterprise run riot."

While many of the objectives of the New Deal, such as assuring workers the right of collective bargaining, are commendable, industry's quarrel is with the Administration's methods, he said. The Republic Steel Corp. chairman, listed three general obstacles to industrial recovery:

1—Policies tending to destroy investors' confidence, such as Government competition with industry as in the utility field, stiffened requirements for new security issues and extreme restrictions for security exchanges.

2—Policies tending to prevent efficient management, as the one-sided labor (Wagner) law and its high-handed administration, and obstacles to enterprise caused by the bewildering maze of federal bureaus, commissions, boards and investigations.

3—Policies upsetting confidence and discouraging business in general, including the spend-lend program of Government financing, resulting in a crushing federal debt load, burdensome taxes and fears of coming inflation, and the filling of federal posts with immature and inexperienced persons of radical views.

"The House investigation of the NLRB provided a glimpse behind the curtain of the New Deal drama," Mr. Girdler said. "We have seen how business has been made the victim of a double squeeze between two Federal agencies. I refer to the agreement of the RFC to withhold loans to any company if a complaint has been filed against the company with the NLRB alleging unfair labor practice. As a result . . . no company applying for a loan from the NLRB dares call its soul its own."

Fleming Promises Just Wage Law Enforcement

CHICAGO—Col. Philip B. Fleming, administrator, Wage and Hour Division of the Department of Labor, told members of the Illinois Manufacturers' Association at a meeting here last week that "strict and even-handed enforcement (of the Fair Labor Standards Act) is vital, and you have my word that you will get it." To prevent one company from being covered by the law while its competitors escape the provisions because of an oversight, Col. Fleming said it was his hope to "let every major business in the country know as definitely as is humanly possible whether or not we consider their employees under the Act."

Mystic Iron Makes Film

BOSTON—The Mystic Iron Works and New England Coke Co. have completed "Iron Men of New England," a natural color motion picture available to foundrymen, schools, church groups, Kiwanis, Rotary and other clubs and organizations. To obtain loan of the film address Mystic Iron Works, 250 Stuart Street, Boston.

White Rabbit or Robot

(CONTINUED FROM PAGE 38-D)

chines involve continuing cost whether working or idle.

"The only machines that are threatened are the nearly submarginal or low efficiency machines which have not yet been purchased for replacements or new installations. If the reemployed were to wait for machines to wear out in order to displace them, most of them would probably be waiting a long time. Most of the men, in order to find jobs, must take work in new occupations.

"While the portion of the nation's energy supplied by man power rises, let us say, from 2 per cent to 2.2 per cent, the energy supplied by machines will have to increase by 5.8 per cent—the balance of the 6 per cent increase, and will rise from 98 per cent to 103.8 per cent. This is necessary if the total for the nation from men and machines combined is to reach 106 per cent.

"Roughly speaking, for each man reemployed under the Daggett Proposal, some 30-odd robots, or machine equivalents of man power are expected to be put to work by the Daggett Proposal.

Full Doses of Job-Protection

"It is a matter of speculation, what job protection differential collection and payment would be needed to effect complete private reemployment today. For that depends in turn upon the present magnitude of unemployment—a dark and little known subject. You can write your own ticket.

"If we assume that 40 per cent of our man power is now unemployed or under employed, then it follows that an increase of two-thirds in the number of jobs is needed to raise employment from 60 to 100 per cent.

"An increase of two-thirds, or 67 per cent in the number of jobs, or in the demand for labor, would follow a decline of about 16 per cent in the real cost of labor, compared to the use of substitutes for labor, if the marginal ratio of labor be three, since a 1 per cent decline compounds to a 16 per cent decline in the same time that a 3 per cent increase compounds to a 67 per cent increase.

"Completely to abolish involuntary unemployment, therefore, we should require not a 2 per cent job protection differential collection and a 1 per cent differential payment, but a 10 per cent collection and a 6 per cent payment, or a 9 per cent collection and a 7 per cent payment, or some other division of the 16 per cent differential into a differential collection and payment.

"The point is that we require a 16 per cent differential, so divided between differential collection and payment as will make the total collection equal the total payment, because the differential collection is only intended to finance the payment.

"Using these figures, the results in increased profits, production, and consumption which have been estimated to follow a 2 per cent differential collection and a 1 per cent differential payment would be increased approximately five-fold.

Full Doses Under Future Progress

"But such a condition of total reemployment is not the end of the story. The march of progress, invention, efficiency and technological skill has perhaps only just begun.

"If today our nation can be fed,

housed and serviced by some 60 per cent of its workers, while the rest of the workers are supported in idleness or in public noncompetitive work, it would seem possible that in another score of years we shall have made at least as great strides as we have made in the last 20 years and shall have reduced this man power requirement again by 40 per cent.

"We should then require only 60 per cent of 60 per cent, or 36 per cent of the nation's man power. In that day, without job protection, only about one-third of our workers will have jobs in private industry.

"In that day, to preserve full employment and maintain domestic markets and purchasing power by private wage distributions, job protection must be such as to generate not a 67 per cent increase in the demand for labor, but a 200 per cent increase in that demand over the demand which would exist without job protection. Only a 200 per cent increase can treble employment from 33 per cent to 100 per cent of the nation's man power.

"Such a 200 per cent increase would require a 31 per cent decline in the real cost of labor as compared with the cost of using substitutes for labor, since a 1 per cent decline compounds to a 31 per cent decline in the same time that a 3 per cent increase compounds to a 200 per cent increase.

"This 31 per cent differential might take the form of a 20 per cent job protection differential collection and an 11 per cent payment, or an 18 per cent collection and 13 per cent payment, or such other rates as will make total differential collection equal to payment.

"The estimates of increased profit, production, consumption and living standards already arrived at for a 3 per cent differential would be increased about 10-fold for a 31 per cent differential.

"The power to satisfy one's wants comes from earnings, which can be increased either by longer working hours or by higher wage rates. From this it follows that living standards can be deliberately improved so long as wage rates can be lifted, and that that portion of the increase in wage rates which is not offset by shorter working hours is used up in higher living standards.

"Taken together, the four items of 'jobs for all,' 'higher wages,' 'shorter hours,' and 'improved living standards,' spell prosperity. All can apparently be realized through the consequences of a sufficiently increased demand for labor among private employers.

"All four can be accomplished by the operation of the Daggett Proposal for deliberate control of this demand."

Financial Notes

The Logan Gear Co., Toledo, Ohio, reports a net profit from operations of $42,083 but a net loss of $52,722 for 1939 after nonrecurring charge-offs due to abandonment of one plant and sale of machinery. During the year it retired $120,000 of debt owed to the Reconstruction Finance Corp.

Truscon Steel Co., subsidiary of Republic Steel Corp., earned a net profit for 1939, after all deductions including provision for federal income taxes, of $560,249, compared with loss of $813,057 for 1938. Sales for 1939 totaled $25,327,714 as compared to $16,174,357 in 1938.

Arthur G. McKee & Co., Cleveland, March 8 declared a regular dividend of 25c. and an extra dividend of 50c., a total of 75c. per share, on the Class "B" common stock. Including the present dividend, $1.50 per share will have been paid on this stock during 1940. This dividend is payable April 1 to stock of record March 20. As of March 8 the company reports cash and receivables of approximately $1,461,000, and payables, including Federal taxes payable later in 1940, of $338,000.

Canadian Industry Busier Under Impetus of War Orders

TORONTO—Continued outpouring of war contracts by the Canadian and British governments for such materials as munitions, guns, ships, aircraft and motor vehicles is putting an abnormal load on Canada's primary steel producers and, despite capacity production rates, mills in this country are unable to meet all demands as required in rush orders. Backlogs are mounting at a rapid rate and it is reported that by the first of September next, expenditure on war account for the Canadian and British governments will exceed $1,000,000,000. To take care of this steadily growing demand for steel, all Canadian primary producers are engaged in extensive plant additions, most of which will be ready for operation within the next couple of months.

In the meantime, however, there is a substantial overflow of steel orders that must be filled without delay, especially for sheets and plates, and this business is going to United States mills. It is reported that imports of steel into Canada from American mills exceed 10,000 tons per week, and this tonnage will be further augmented by orders for steel for ships of the sub-chaser, mine-sweeper and merchant types in connection with which additional contracts are under negotiation.

To bring Canadian industry to a point where it can more readily handle the increasing flow of war contracts, large quantities of machinery and tools are being purchased, both from Canadian builders and American producers. Orders have been placed during the past couple of weeks for machinery and tools with United States firms in excess of $600,000 and it is understood that other large orders are pending. Canadian tool makers also are running full time to take care of new business.

Shipbuilders on the Pacific coast are placing orders for equipment for ships in connection with which contracts were received recently from the Canadian War Supply Board, totaling upward of $16,000,000. It is reported that Dominion Bridge Co., Vancouver, B. C., will build boilers for the four sub-chasers under construction at Burrard Drydocks, while Vancouver Iron Works, Vancouver, will supply boilers for six ships being built by North Vancouver Ship Repairs. Sub-contracts for boilers for other ships under construction in British Columbia yards have still to be let.

General Motors' Statement

H. J. Carmichael, vice-president and general manager of General Motors of Canada, advises that the item referring to General Motors which appeared under Canadian news in THE IRON AGE of Feb. 22, was inaccurate. Mr. Carmichael states:

"The production of passenger and commercial vehicles by General Motors of Canada is proceeding unimpaired by the acceptance of war orders. In the interests of accuracy and because of ill-founded reports which always circulate in war time, it is advisable at the present time to emphasize that the production fa-

cilities of General Motors of Canada are more than adequate to fill all orders for private and commercial vehicles, in addition to war orders which General Motors, in common with other large industrial concerns, has received from the Dominion Government and other friendly powers. Contrary to reports which have even, in some instances, found their way into public print this company is perfectly able to make its full contribution to Canada's war effort without altering its custmoary production schedules."

R. M. Sale, sales manager of Ford Motor Co. of Canada, Ltd., Windsor, reports that an all time high record in sales of trucks and commercial cars was established for the three months ended Jan. 31. Ford truck and commercial car sales in Canada for January show increase of 118 per cent over the same month a year ago.

New War Contracts

Contracts placed by the War Supply Board for the week had a total value of $3,500,000. These companies receiving contracts include Metal Stampings, Ltd., Toronto, $25,455; Otaco, Ltd., Orillia, $22,435; Beatty Brothers, Fergus, Ont., $13,267; Firestone Tire & Rubber Co., Ltd., Hamilton, $381,455; Dunlop Tire & Rubber Goods Co., Ltd., Toronto, $173,663; Goodyear Tire & Rubber Co. of Canada, Ltd., New Toronto, Ont., $381,557; Metallic Roofing Co., Toronto, $54,800. Aircraft supply contracts were placed with British Air Ministry at $198,591; Irvin Air Chute, Ltd., Ottawa, at $36,000 and Canadian Vickers, Ltd., Montreal at $24,732. Machinery order valued at $31,700 was placed with J. S. Innis, Ltd., Toronto. Sterling Construction Co., Ltd., Windsor, received contract for construction work at Royal Canadian Air Force station at Fort William, costing $70,700. British War Office received order for munitions valued at $100,000. Greater part of the remaining contracts were for clothing and accessories valued at $1,437,758.

Building Work Progresses

Building construction programs throughout Canada, involving new plants and addition, commercial buildings, government projects, etc., are responsible for continued heavy placing of orders for reinforcing and structural steel. In addition a number of large contracts are pending which will run to several thousands of tons. Reinforcing steel orders pending include 500 tons for subway at Montreal for Canadian National Railways; 500 tons for bridge at Rockfield, St. Pierre, Que., for Canadian National

Railways, 360 McGill Street, Montreal. Reinforcing steel awards include 1,000 tons to Steel Co. of Canada, Ltd., Hamilton, for flour mill and grain elevator at Humberstone, Ont., for Robin Hood Mills, 300 St. Sacrament Street, Montreal; 300 tons to Cowin & Co., for warehouse for Security Storage Co., Ltd., 725 Portage Avenue, Winnipeg, Man.; 300 tons to Truscon Steel Co. of Canada, Ltd., 1 Berri Street, Montreal, for R.C.A.F. magazine for War Supply Board at Debert, N. S.

Structural steel awards include 300 tons to Frankel Brothers, Ltd., Toronto, for department store at Kitchener, Ont.; 150 tons to Hamilton Bridge Co., Ltd., for store for C. L. Robins, Hamilton; 150 tons to Standard Steel Construction Co., Ltd., Port Robinson, Ont., for office building in St. Catharines for Yale & Towne Mfg. Co.; 500 tons to St. John Dry Dock Co., East St. John, N.B., for gymnasium building for University of New Brunswick; 300 tons to Dominion Bridge Co., Ltd., Vancouver, B.C., for educational building for Vancouver Exhibition Association, Vancouver.

Toledo Edison to Spend $4,250,000 on Expansion

TOLEDO—Rapid gains in power consumption plus the new requirements for the Lake Erie water system led to an order by the Toledo Edison Co. for a new 50,000-kw. turbo-generator for its Acme power plant here. The company will expend about $4,250,000 in plant expansion. Generator and boilers will cost about $3,500,000 and the remainder of the program will include new overhead lines, transformers, and other distribution equipment. Capacity will be increased from 175,000 hp. to 240,000 hp.

Joseph T. Ryerson & Son Enlarges Detroit Plant

A NEW high-bay type span has been added to the Detroit plant of Joseph T. Ryerson & Sons, Inc., Chicago. The new span increases floor space by over 30,000 sq. ft., bringing the total floor area of the Detroit Ryerson plant to approximately 250,000 sq. ft. In addition to housing part of the hot rolled steel stock, the new building will increase facilities for reinforcing steel-service to contractors and builders.

More than 1000 new products and sizes have been added to the range of steel and allied products now carried.

Air Circuit Breaker Shown by Westinghouse

EAST PITTSBURGH, Pa.—More than 100 steel engineers and executives last week witnessed the testing of a compressed air circuit breaker at the maximum short-circuit capacity of the largest high-power laboratory in the country during a Westinghouse Electric & Mfg. Co. demonstration here.

The compressed air breaker, a newly developed device, was tested on power interruptions ranging from the opening of normal load current of 2000 amp. at 13,200 volts to the three-phase, 1,500,000 kva. short circuit capacity of the high-power laboratory. Oscillograms made during the demonstration showed that all currents were interrupted at the first current zero, with about one-half cycle of arcing, and throughout the entire range of tests no transient voltage greater than twice normal was observed. Following the completion of tests the breaker was dismantled to show guest engineers how astonishingly small was the amount of wear on both moving and stationary contacts in a breaker of this type after a series of operations.

A second series of tests was applied to a smaller new air breaker utilizing an adaptation of the "De-ion" principle. The three-phase, 2300 volt unit tested had a normal rating of 1200 amp. and an interrupting capacity of 150,000 kva. Opening a short circuit of approximately 175,000 kva., this breaker cleared faults within one-half cycle of arcing.

Warehouse Association Organizes at Birmingham

CLEVELAND—The 19th chapter of the American Steel Warehouse Association, Inc., has recently been organized, with headquarters at Birmingham. Officers of the Southern chapter are: President, Phil Pidgeon, Pidgeon-Thomas Iron Co., Memphis, Tenn.; vice-president, I. W. Tull, J. M. Tull Metal & Supply Co., Atlanta; secretary-treasurer, George W. Smith, Southern Steel Co., Birmingham. Mr. Pidgeon will also represent this new chapter on the national board of directors. Territory embraced by the new chapter includes the states of Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, and Tennessee.

The following companies are members of the chapter: Battery Machinery Co., Rome, Ga.; Bulford Brothers,

Inc., Nashville; Fulton Supply Co., Atlanta; Industrial Supplies, Inc., LaGrange, Ga.; Ingalls Iron Works Co., Birmingham; Jones & Laughlin Steel Corp., Memphis, Tenn., and New Orleans; Pidgeon-Thomas Iron Co., Memphis; Southern Steel Co., Birmingham; J. M. Tull Metal & Supply Co., Inc., Atlanta, and Vance Iron & Steel Co., Chattanooga, Tenn.

Patent for Reversible Window Acquired by N. Y. Company

REVERSIBLE Double-Hung Window Corp., 103 Park Avenue, New York, has acquired patent rights to a newly developed reversible double hung window made of wood Kalamein, hollow metal and steel. The new window, according to B. Pollina, president of the company, eliminates safety locks and safety belts, enabling window cleaners to bring the outside of the window into reach by a touch of the finger.

United Engineering Spends Million at Youngstown

UNITED ENGINEERING & FOUNDRY CO. net earnings in 1939 were $2,149,328, equal, after preferred dividends, to $2.55 per share of common stock, compared with $3,192,619, or $3.82 per common share, in 1938. Approximately one-third of the 1939 earnings resulted from business done with customers in foreign countries, George T. Ladd, president, said.

United Engineering is expending $1,000,000 on a program of improvement and consolidation of facilities at the Youngstown, Ohio, plant.

Lift Republic Mill's Capacity

CLEVELAND—Capacity of the Republic Steel Corp. wide plate mill at Gadsden, Ala., will be increased through installation of a third slab heating furnace. An addition 110 ft. wide by 220 ft. long will be made to the existing plate mill warehouse. Another addition will be made to the new structure recently completed for Truscon Steel Co. and which is used for the manufacture of welded road and reinforcing mesh. The addition, 72 ft. wide by 336 ft. long, will be used, in part, to house a third mesh-making machine.

Ferroalloy Plant Completed

PRODUCTION at the new Sheffield, Ala., ferroalloy plant of Electro Metallurgical Co., a unit of Union Carbide & Carbon Corp., is expected to be started April 1.

. . . THE NEWS IN BRIEF . . .

Automobile production stays at relatively high level.—**Page 50.**

Machine tool industry activity 92.9 per cent in February contrasted with 93.3 per cent in January.—**Page 53.**

General Motors Corp. added 29,929 employees during 1939.—**Page 53.**

Spring meeting of Associated Machine Tool Dealers of America to be held at Atlantic City, May 13-14. —**Page 53.**

New Labor Board and changed procedure may come in present session of Congress; drastic Wagner Act revisions unlikely.—**Page 54.**

Dow Chemical Co. to build $5,000,000 plant for producing magnesium from sea water.—**Page 58.**

Bureau of Construction and Repair to buy armor plate, ballistic steel, etc., hereafter.—**Page 58.**

Only 14 of the nation's 375 rolling mill plants are operated by steel consumers solely for their own use.—**Page 58.**

Administration, with election near, may revitalize PWA.—**Page 60.**

Hillside Fluorspar Mines, Chicago, plans to drill untested properties as result of war.—**Page 62.**

Government awards for iron and steel products in week ended March 9, totaled $561,281.—**Page 63.**

Walsh-Healey Law lacks majority support in Congress today.—**Page 65.**

Steel inventories reported 0.3 per cent higher in January by U. S. Bureau of Commerce.—**Page 67.**

Mystic Iron Works and New England Coke Co. complete color film, "Iron Men of New England."—**Page 68.**

Check New Deal bureaucracy to push America off "dead center," Tom M. Girdler tells Boston business men.—**Page 68.**

Administrator Fleming, of Wage-Hour Division, promises "evenhanded" enforcement of labor standards act.—**Page 68.**

Canadian industry busier under stimulus of war orders. Overflow of steel orders comes to United States.—**Page 71.**

Toledo Edison Co. announces $4,250,000 plant expansion.—**Page 73.**

Joseph T. Ryerson, Inc., adds new span to Detroit plant.—**Page 73.**

American Steel Warehouse Association organizes chapter at Birmingham.—**Page 74.**

SECTIONS INDEX

MEETINGS

April 10 to 12—International Acetylene Association, annual convention, Milwaukee.

April 11 and 12—Galvanizers Committee of American Zinc Institute, annual spring meeting, Pittsburgh.

April 25 and 26—Concrete Reinforcing Steel Institute, 16th annual meeting, Hot Springs, Va.

May 6 to 8—Machine tool electrification forum, East Pittsburgh works of Westinghouse Electric & Mfg. Co.

May 6 to 10—American Foundrymen's Association, annual meeting and equipment exhibition, Chicago.

May 7 and 8—Society of Automotive Engineers, national production meeting, Hartford.

May 13 and 14—Spring meeting, Associated Machine Tool Dealers of America, Atlantic City, N. J.

May 20 to 22—American Gear Manufacturers Association, annual meeting, Asheville, N. C.

May 23—American Iron and Steel Institute, annual meeting, New York.

Compressed air circuit breaker is exhibited at Westinghouse Electric & Mfg. Co. laboratory.—**Page 74.**

Patent for reversible window is obtained by New York company.—**Page 75.**

Capacity of Republic Steel Corp.'s wide plate mill at Gadsden, Ala., will be increased.—**Page 75.**

United Engineering & Foundry Co. expends $1,000,000 for improving Youngstown plant.—**Page 75.**

Ferroalloy plant completed.—**Page 75.**

While 1939 was Republic Steel Corp.'s best year, profits on investment were under 5 per cent.—**Page 78.**

Light steel products totaled 45 per cent of all finished steel shipments in 1939.—**Page 78.**

Attorney General Jackson to investigate alleged lobbying activities of NLRB.—**Page 79C.**

Averaging of minimum wages over two or more weeks held to be violation of Wage and Hour law. —**Page 79C.**

Copperweld Steel Co. announces it will start making alloy steel by May 1.—**Page 79C.**

National Labor Relations Board decisions in a number of industrial cases.—**Page 79C.**

Republic Steel Corp. complies with NLRB order at its Beaver Falls, Pa., plant.—**Page 79C.**

U. S. Government buys 10,000 tons of manganese ore under strategic material purchasing program.—**Page 79C.**

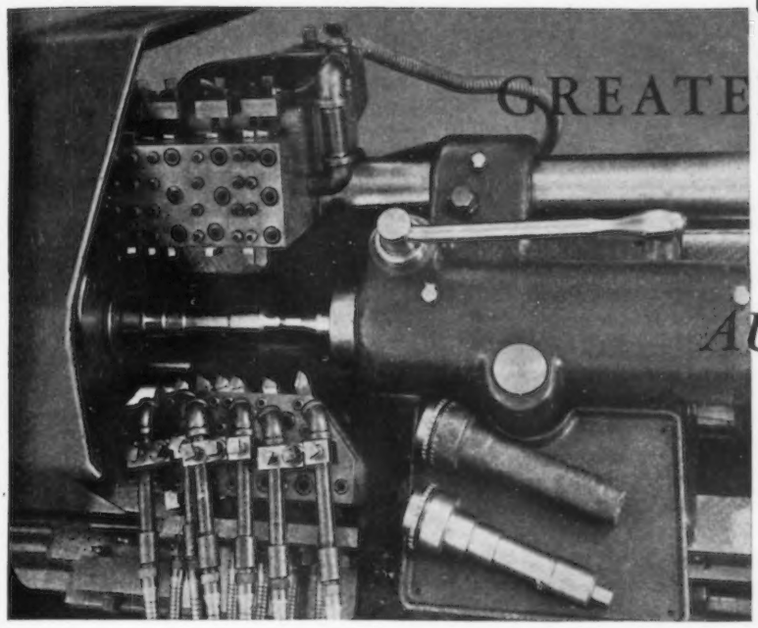
Argentine Government studies steel making in United States through representative in Pittsburgh. —**Page 79D.**

Steel exports decline for neutral European countries; severe winter affects shipments, building.—**Page 80.**

Scrap consumption in U. S. declined 19 per cent in February.—**Page 80.**

Westinghouse orders in 1939 up 43 per cent to third highest level in company's history.—**Page 100.**

Increased Profits



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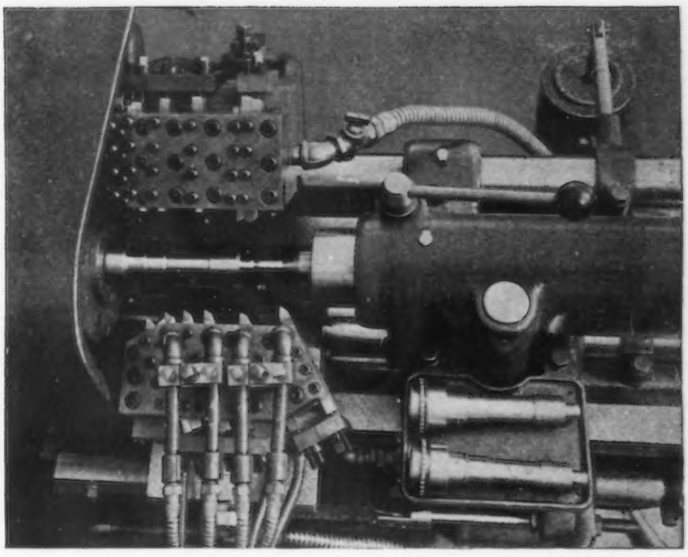

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1939 Best Year for Republic But Profits Stay Under 5%

CLEVELAND—While 1939 net profit of $10,671,343 for Republic Steel Corp. was the best in the corporation's history, the amount earned is less than 5 per cent on the money invested by stockholders, without compensation for materially lower profits during prior years, it is pointed out by T. M. Girdler, chairman, and R. J. Wysor, president, in the annual pamphlet report.

Total sales and operating revenue of Republic and its subsidiaries for 1939 amounted to $232,014,074. Direct manufacturing cost absorbed 80.4 per cent of the revenue; general administrative and selling expense 6.4 per cent; depreciation and depletion 4.9 per cent and interest charges 1.8 per cent. Provision for estimated Federal income taxes amounted to $2,450,000. In addition to the regular rates of wages paid, the cost to the corporation of group insurance, vacations with pay, overtime and social security taxes amounted to an average of six cents an hour for all hours worked by all employees.

The report states that during the year Republic produced 4,301,667 tons of ingots, the average rate of production being 66.2 per cent of capacity. Shipments of steel products totaled 3,312,784 net tons while 606,681 tons of pig iron were shipped. Capital expenditures for improvements amounted to $9,128,770.

Except for the war in Europe and the domestic political situation prior to the Presidential election there are no uncertainties which would appear to indicate a lower volume of business in 1940 than in the year preceding, according to Mr. Girdler and Mr. Wysor.

Light Steels 45% Of 1939 Shipments

LIGHT steel products, used principally by consumer goods industries, constituted more than 45 per cent of the total of 38,850,000 net tons of finished steel shipped by the steel industry last year, according to reports of the American Iron and Steel Institute.

The proportion of light products to total shipments last year was higher than in either 1936 or 1937, but fell below 1938 when light steel products were 46.3 per cent of the total of 23,512,000 net tons of finished steel. Shipments of finished steel last year were 65 per cent above 1938, but fell below 1936 and 1937 by 4 per cent and 8 per cent respectively. Light products were 43 per cent of the total in both 1936 and 1937.

Shipments last year of light steel products, including sheets and strip steel, tin plate and wire products, totaled 17,524,000 net tons. Shipments of heavy products such as rails, structural shapes, plates, bars, pipe, etc., totaled 21,327,000 tons.

Tin plate represented 7.8 per cent of 1939 shipments, compared with 8.4 per cent in the preceding year.

REINFORCING STEEL

. . . Awards of 14,230 tons; 11,100 tons in new projects

AWARDS
ATLANTIC STATES

850 Tons, Baltimore, Armistead Gardens housing project, to Bethlehem Steel Co., Bethlehem, Pa., through Dietrich Bros.

575 Tons, Washington, Grocers' Finance Co. building, to Sweets Steel Co.

360 Tons, Long Island City, N. Y., midtown elevated highway, to Jones & Laughlin Steel Corp., Pittsburgh, through Fireproof Products Co.

270 Tons, Peabody-Danvers, Mass., State road and bridge, to Bethlehem Steel Co., Bethlehem, Pa. M. DeMatteo Construction Co., Roslindale, Mass., contractor.

250 Tons, Westmoreland County, Pa., contract 5P3, Pennsylvania Turnpike, to Bethlehem Steel Co.

210 Tons, Queens, N. Y., borough hall, to Igoe Bros., Newark, N. J.

180 Tons, New York, Queens midtown tunnel, contract 12-B, to Jones & Laughlin Steel Corp., Pittsburgh, through Fireproof Products Co.

180 Tons, Providence, R. I., Hope Street viaduct, to Concrete Steel Co., Boston.

125 Tons, Providence, R. I., Rhode Island School of Design auditorium, etc., to Bethlehem Steel Co., Bethlehem, Pa. Turner Construction Co., Boston, contractor.

SOUTH AND CENTRAL

2500 Tons, Toledo, Ohio, reservoir, contract "P," to Bethlehem Steel Co., through Hausman Steel Co., Toledo.

440 Tons, Chicago, subway, section S-9-A, to Republic Steel Corp., Cleveland, through O. J. Dean.

360 Tons, Louisville, Ky., bottling plant, Seagram & Co., to Pollak Steel Co., Cincinnati.

350 Tons, Winnetka, Ill., grade crossing, to Truscon Steel Co., Youngstown.

300 Tons, Decatur, Ill., Spencer-Kellogg Co. storage tanks, to Missouri Rolling Mill Corp., Jones-Hettelsater, contractor.

200 Tons, Chicago, W. C. Ritchie Co. box factory, to Bethlehem Steel Co., Bethlehem, Pa.

170 Tons, Jefferson County, Mo., highway bridge, to Laclede Steel Co., St. Louis, through, Odell & Riney, St. Louis, general contractors.

100 Tons, Neenah, Wis., Kimberly-Clark Corp. building, to Cook & Brown Lime Co., Oshkosh, Wis.

WESTERN STATES

3750 Tons, Los Angeles, Sepulveda Dam, to Blue Diamond Corp. Los Angeles, through Jahn-Bressi-Bevanda, J. A. Dowling and David G. Gordon, Los Angeles, contractors.

1050 Tons, Odair, Wash., Grand Coulee Dam Invitation B-38141-A), to Bethlehem Steel Co., San Francisco.

900 Tons, Sawtelle, Cal., Veterans' buildings, to Soule Steel Co., Los Angeles, through Robert E. McKee, Los Angeles, contractor.

415 Tons, Chino, Cal., State prison, to Consolidated Steel Corp., Los Angeles, through Pozzo Construction Co., Los Angeles, contractor.

360 Tons, Santa Barbara, Cal., junior college industrial unit, to Ceco Steel Products Co., Los Angeles, through Azevedo Construction Co., Sacramento, Cal., contractor.

234 Tons, Clyde, Cal., Central Valley project (Invitation 49107-A), to Judson Steel Corp., San Francisco, Cal.

100 Tons, Los Angeles, improve Sepulveda Boulevard, to Blue Diamond Corp., Los Angeles, through Griffith Co., Los Angeles, contractor.

PENDING REINFORCING BAR PROJECTS
ATLANTIC STATES

680 Tons, Baltimore, office building, Chesapeake & Potomac Telephone Co.

350 Tons, New Bedford, Mass., housing project.

128 Tons, Brooklyn, Floyd Bennet Field, seaplane hanger; bids in.

SOUTH AND CENTRAL

350 Tons, Fayette County, Ky., Public Health Service building; bids March 15; Fleischer Engineering & Construction Co., Buffalo, low bidder.

300 Tons, Lexington, Ky., housing projects; bids March 23.

280 Tons, Milwaukee, plant for Ladish Stoppenbach Malting Co.

225 Tons, Milwaukee, plant, Ladish Drop Forge Co.

160 Tons, Painesville, Ohio, Industrial Rayon plant addition; Geo. A. Rutherford Co., Cleveland, general contractor.

WESTERN STATES

4750 Tons, Los Angeles, Los Angeles River improvement, section V; bids about April 29.

2650 Tons, Coram, Cal., Shasta Power plant (Invitation 33444-A); bids March 27.

350 Tons, Placentia, Cal., Fullerton Dam; bids about April 25.

225 Tons, Lakeside, San Diego County, Cal., San Diego River bridge; bids April 4.

190 Tons, Sunnyvale, Cal., technical service building at Moffett Air Field; Dinwiddie Construction Co., San Francisco, low bidder on general contract.

165 Tons, Kettle Falls, Wash., Kettle Falls bridge (Invitation 38167-A); bids in.

165 Tons, Mono County, Cal., Leevining Creek conduit for Los Angeles Department of Water and Power (Specifications 3374); bids April 2.

119 Tons, Cody, Wyo., Shoshone project (Invitation 48277-A); bids in.

CAST IRON PIPE

Milton, Mass., has closed bids on its 1940 cast iron pipe requirements, but as yet has made no award. Several hundred tons are involved. Bidders were R. D. Wood Co., U. S. Pipe & Foundry Co. and Warren Foundry & Pipe Corp., Boston.

City Council, Philadelphia, has adopted an ordinance authorizing financing in amount of $18,000,000 for expansion and improvements in water system, including pipe line extensions and replacements, main trunk lines for increased supply, pumping stations, service installations and other facilities. Proposal for bond issue will be submitted to voters for ratification at primary election on April 23. Work on project is scheduled to begin early in June, and will be in charge of Department of Public Works, City Hall. John H. Neeson, director.

Asheboro, N. C., plans pipe line extensions and replacements in water system. Fund of $70,000 has been arranged through Federal aid for this, fire hydrants and accessory water installation. Department of Public Works, W. E. Yow, superintendent, is in charge.

Waverly, Mo., has plans for pipe line extensions in water system and other waterworks installation. Special election will be held on April 2 to approve bonds for $33,000 for project. Total fund of $100,000 is being arranged for this and sewer system, remainder of appropriation to be secured through Federal aid. Harrington & Cortelyou, Dwight Building, Kansas City, Mo., are consulting engineers.

Harvard, Mass., plans 6 to 10-in. pipe for extensions in water system; also new 250,000-gal. steel standpipe, pumping machinery and other waterworks installation. Cost about $400,000. H. E. Bailey, 177 State Street, Boston, is consulting engineer.

Avalon, N. J., plans new 12-in. pipe in part of First Avenue, to replace present 4-in., for main water supply and other pipe line extensions. Cost about $34,000. Financing has been arranged through Federal aid. Department of Public Works, N. C. Joiner, director, is in charge.

General Purchasing Officer, Panama Canal, Washington, closes bids March 25 for 600 ft. of 4-in. cast iron water pipe, fittings, pressure gages, etc. (Schedule 3943).

Boiling Springs, N. C., is arranging fund of $26,000 out of total appropriation of $95,000, to be secured through other financing, for pipe line extensions in water system and other waterworks and sewage system installation.

Long Beach, Cal., will take bids March 26 on 1116 ft. of 12-in., 6677 ft. of 8-in. and 8851 ft. of 6-in. pipe and fittings.

Pasadena, Cal., will take bids March 27 on 4000 ft. of 4-in., 15,000 ft. of 6-in., 10,000 ft. of 8-in., and 4800 ft. of 12-in. pipe.

Navy Buying Steel On 6-Month Basis

DESIGNED to reduce the period of obligation for contractors and give definite completion date on contracts which the Navy believes will prove advantageous both to it and producers, buying of steel, except armor plate, is being done experimentally by the Navy on a six months' basis. In announcing the new plan of steel purchases, the Navy said that if satisfactory bids are not received in response to this invitation it will doubtless be necessary to return to the original method of steel procurement.

In the past the Navy has bought steel by two methods: The bulk of steel for new construction purposes has been bought on a "period of construction" contract where the Navy asked for bids on the estimated quantity of steel required to build ships and where the bidder has given the Navy a fixed price for that steel over periods ranging from two to four years, depending on the time to build the ships. The Navy has also gone into the market once every six months for "stock replenishment" requirements of steel where it has asked for definite bids on those definite sizes and quantities of steel required for general repair work at Navy yards.

"In an effort to eliminate the long-term guarantee of prices on new ship construction," the statement said, "the Navy has issued a schedule combining our new construction and repair needs in one schedule and asking for firm prices for periods of six months only. As in the 'period of construction' contract, we are calling for estimated quantities only, the successful bidder to receive orders from Navy yards requiring the steel."

TRADE NOTES

William R. Bauer, manufacturers' representative, Park Bldg., Pittsburgh, has been appointed representative for the Hill Clutch Machine & Foundry Co., Cleveland, manufacturer of power transmission machinery for belt, rope, gear and agitator drive.

Superior Steel Corp., Pittsburgh, has appointed Edgcomb Steel Co., Philadelphia, and Edgcomb Steel Corp., Newark, N. J., as sales representatives and warehouse distributers of cold rolled stainless steel.

The William M. Bailey Co. has purchased exclusive manufacturing and sales rights under the August F. Giese patents on blast furnace clay guns. According to the company, it already had the exclusive manufacturing and sales rights under the Hopkins, Osolin & Ferree design patents as well as being licensed under the Hopkins method patent. The Bailey company will market its electric plunger clay gun under a combination of the above patents, incorporating the best features of all the patents in the manufacture of its gun.

. . . PERSONALS . . .

A. W. KROWELL has been made superintendent of the production department of the Gary works of Carnegie-Illinois Steel Corp. RALPH D. PETERSON becomes assistant superintendent of this department and W. J. HUGE receives the post of assistant to superintendent of blast furnaces.

Mr. Krowell was first employed at Gary works in 1915 as a marker in the merchant mill. He served at this mill in various capacities until 1920 when he was made general finishing end foreman of the 160-in. plate mill. In 1925 he was given the same post at the 60-in. plate mill and after remaining in this position for nine years, he was appointed finishing end foreman of the plate mills. A short time later he was made chief skipper and in 1937 he became assistant superintendent of the production department, the position he held until the present time.

Mr. Peterson went to Gary works in 1912 as a painter in the plate mill. He was continuously employed in the plate mills until 1939 when he received the position of chief provider for the slab and plate mills, the post he held at the time of his appointment. During his employment at Gary, Mr. Peterson also served as assistant provider, provider, mill foreman, and steel provider.

Mr. Huge began at Gary works as a blower in the blast furnace department in 1912 after four years of general furnace practice at South works. Remaining here a short time, he left Gary to return again in 1928 as assistant superintendent of blast furnaces Nos. 7 to 12. He served in this capacity and as a metallurgist until his recent appointment.

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J. J. REYNOLDS, who has been sales representative for the past 13 years in the New York office of Lukens Steel Co., Coatesville, Pa., has been appointed manager of sales at New York, succeeding GEORGE L. GORDON, who has been transferred to the company's main office at Coatesville, Pa., where he will engage in special sales work in the interests of Lukens and its divisions, By-Products Steel Corp., and Lukenweld, Inc.

Mr. Reynolds received his formal education at Temple University and before joining Lukens was identified with David Lupton & Sons, Baldwin Locomotive Works and York Safe & Lock Co.

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JAY IRWIN has been appointed Chicago district manager of the steel and tube division of the Timken Roller Bearing Co., Canton, Ohio. Mr. Irwin has been a salesman in the Chicago office since 1937. He was formerly identified with the Canton Sheet Steel Co., Milwaukee Rolling Mill Co., and Inland Steel Co.

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J. J. MCILHINNEY, manager of the Continental Can Co. plant in Chicago's Clearing Industrial District, has been elected president of the Clearing Industrial Association.

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DWIGHT L. MOODY, general purchasing agent for the Indian Motorcycle Co., Springfield, Mass., has been made general manager and vice-president to succeed the late Loring F. Hosley. Mr. Moody has been connected with the company since 1917, when he established and operated a dispatching department for the procurement of materials during the World War. Prior to that time he was in the engineering department of the H. B. Smith Co., Westfield, Mass., and also worked for the old Knox Motor Car Co.

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JOHN F. DOLAN, associated with Peck, Stow & Wilcox, Southington, Conn., since 1910, for the past six years as assistant sales manager of the small tools and hardware division of that company, has joined the sales organization of the Chicago plant of the Lamson & Sessions Co., Cleveland. He will represent the company in Iowa, Kansas, Missouri, Nebraska, North and South Dakota and Oklahoma.

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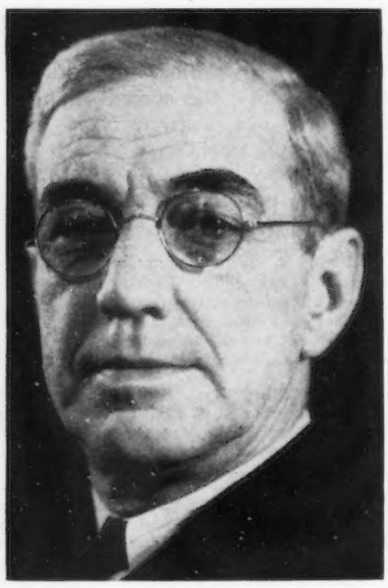
JAMES Y. SCOTT was elected president of the Van Norman Machine



A. W. KROWELL (left), superintendent production department, Gary works, Carnegie-Illinois Steel Corp. Ralph D. Peterson (center), assistant superintendent, production department, and W. J. Huge (right), assistant to superintendent of blast furnaces.

Tool Co., Springfield, Mass., at a meeting of the directors on March 5.

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JAMES G. DAVEY, formerly divisional superintendent, stainless sheet and strip division, Republic Steel Corp., has been made plant manager of the Eastern Rolling Mill Co., Baltimore, Md.

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JAMES T. PARDEE, chairman of the board and vice-president of Dow Chemical Co., Midland, Mich., has been granted the honorary degree of doctor of commercial science by Case School of Applied Science. He is a graduate of that institution.

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FRANK E. GRAPER has been named president and general manager of the Acklin Stamping Co., Toledo, filling the vacancy caused by the death of W. COLLARD ACKLIN. F. CYRIL GREENHILL is vice-president and general sales manager, and ALVIN E. SEEMAN, vice-president and treasurer. These three with HUBERT D. BENNETT and GEORGE MEDILL compose the directorate.

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L. R. HANSON, director of research, Clark Controller Co., Cleveland, has been elected to the board of directors to succeed C. H. RIPPL, who resigned last summer.

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H. E. DRALLE, since 1930 gearing representative in the northwestern and southwestern districts for the Nuttall works of Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has been made manager of the petroleum and chemical section of the industry engineering department. He has been identified with the company since his graduation from the University of Illinois in 1916.

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ROBERT H. HEYER, who was the recipient of the Dudley Medal in 1938 from the American Society for Testing Materials, has been appointed to the staff of Battelle Memorial Institute. He was formerly a research metallurgist with the American Rolling Mill Co. and previous to that was a member of the faculty at Purdue University.

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ARDEN L. KNIGHT, formerly New England sales manager for the Wheelock Lovejoy Co., Cambridge, Mass., has joined the sales force of the Hartford, Conn., office of the Latrobe Electric Steel Co., Latrobe, Pa.

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E. H. KLIEBENSTEIN has been placed in charge of the New York office, at 856 East 136th Street, of the Link-Belt Speeder Corp., Chicago.

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WALTER L. MAXSON has been appointed sales manager and chief engineer of the mining machinery division of the crushing, cement and mining machinery division of the Allis-Chalmers Mfg. Co., Milwaukee, and WILLIAM C. JOHNSON, sales manager of the crushing and cement machinery division.

Mr. Maxson, who has been a sales engineer in the mining division for many years, is a graduate of Cornell University in mining and Colorado School of Mines in metallurgy. Before becoming associated with Allis-Chalmers, he served a number of mining companies and was professor of metallurgy at the Colorado School of Mines.

Mr. Johnson was manager of the Knoxville, Tenn., district office which he opened after having been in the Atlanta and Chattanooga territories. He joined the company in 1924 and assisted in the development of the Newhouse crusher while working in the shops and later in the erection department.

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GEORGE ZABEL, of Fairbanks, Morse & Co., Beloit, Wis., addressed the Wisconsin chapter of the American Foundrymen's association on "Foundry Costs" at its last meeting at the Schroeder Hotel, Milwaukee. H. W. DIETERT, Detroit, and N. J. DUNBECK, Eifort, Ohio, also spoke.

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THOMAS D. JOLLY, director purchases and chief engineer of the Aluminum Co. of America, Pittsburgh, and president of the National Association of Purchasing Agents, was the principal speaker at a meeting of the Milwaukee Association of Purchasing Agents in the Elks Club at Milwaukee. He said that with the European war creating a serious economic problem in the United States, the most important thing for America to do is to look out for itself.

J. J. REYNOLDS, New York district manager, Lukens Steel Co.

E. T. LORIG, whose promotion to the staff of the chief engineer of Carnegie-Illinois Steel Corp. at Pittsburgh was announced last week. His new title is engineer, special assignments.

ALBERT J. BERDIS, whose appointment as chief engineer of the Irvin works of Carnegie-Illinois Steel Corp. was announced in these columns last week.

NLRB DECISIONS

WASHINGTON — The National Labor Relations Board has:

Certified AFL's Pattern Makers' Association of Birmingham as the collective bargaining agent for pattern makers and CIO's SWOC as the collective bargaining agent for production and maintenance employees at the plant of the McWane Cast Iron Pipe Co., Birmingham.

Dismissed certification petition of AFL's Pattern Makers' Association of York and vicinity on behalf of pattern makers employed by the Read Machinery Co., Inc., York, Pa.

Ordered election among the 28 employees of the Portland Iron Works, Portland, Ore., to determine whether or not they desire to be represented by AFL's Williamette Lodge No. 63, International Association of Machinists, for the purposes of collective bargaining.

Ordered the Detroit Steel Products Co., Detroit, to disestablish Detroit Steel Products Mutual Benefit Association as a collective bargaining representative for any of its employees at its sash plant and to "cease giving effect to wage-hour agreement of Aug. 16, 1937, with the Mutual Association." Ordered dismissal of CIO-UAW union complaint in so far as it alleged company dominated and interfered with formation and administration of Detroit Steel Products Spring Workers' Association.

Certified four AFL unions and one CIO union as collective bargaining representatives of employees at the plant of the United States Pipe & Foundry Co., Bessemer, Ala. The certifications followed secret ballot elections which resulted in selection by a majority of the employees in the various units. The unions selected and the number of votes cast by each follows: AFL's International Association of Machinists, 85; CIO's Amalgamated Association of Iron, Steel and Tin Workers, 19. AFL's International Brotherhood of Electrical Workers, 12; CIO union, none. AFL's International Brotherhood of Boilermakers, Iron Ship Builders, Welders and Helpers, 11; CIO union, none. AFL's Pattern Makers Association of Birmingham, 9; CIO union, none. CIO's Amalgamated Association, 414; AFL's International Molders' Union, 126.

Jackson to Probe NLRB Lobbying

WASHINGTON—Attorney General Robert H. Jackson is gingerly fingering the job of investigating lobbying activities of Federal agencies.

Mr. Jackson agreed to conduct such an investigation after he had advised the special House committee investigating the National Labor Relations Board that it had been the custom for a century to give opinions only to the President and executive departments (see THE IRON AGE for Feb. 29, p. 71), and that he could not, therefore, express an opinion on evidence submitted to the committee that labor board members had lobbied NLRB appropriations through Congress.

Now the Attorney General faces the delicate task of either whitewashing the labor board or substantiating the Smith committee's charges all because of an almost forgotten rider to a deficiency appropriation bill pushed through Congress back in 1919. The provision says that "no part of the money appropriated by any act," unless specifically authorized, can be used in an effort to influence Congress.

Although no subsequent law has authorized an exception, it has been common custom for Federal agencies to lobby for themselves, according to evidence uncovered by Committee Counsel Edmund M. Toland. Moreover the practice, an old New Deal custom, has been on the increase since Federal agencies started to multiply back in 1933.

U. S. Government Buys 10,000 Tons Manganese Ore

WASHINGTON — Contracts totaling $304,000 for 10,000 tons of manganese ore—5000 tons to be of domestic origin—were awarded early this week by the Treasury Department's Procurement Division under the Government's $100,000,000 strategic material stock pile purchasing program.

Lucien L. Patrick, of Los Angeles, was awarded a $148,000 contract for 5000 tons of Grade A domestic ore to be shipped to the U. S. Army Ordnance Depot, Ogden, Utah.

L. W. Lambert Co., Upper Lake, Cal., was given a $156,000 contract for 5000 tons of Grade B Philippine ore to be shipped to Baltimore. This contract replaces the $180,000 contract previously awarded the Greenbrier Mining Corp., White Sulphur Springs, W. Va., which was organized under the direction of Representative Andrew J. May, chairman of the House Military Affairs Committee. Treasury officials said that the Greenbrier company had defaulted on its contract through failure to post a performance bond.

If the $180,000 price had not been obtainable from other bidders, the Greenbrier company would have had to put up the difference. Since the contract was awarded at a lower figure the Government was $24,000 to the good, officials said.

Averaging Minimum Wages Held to Be Illegal

WASHINGTON—In an opinion announced Tuesday, George A. McNulty, general counsel of the Wage and Hour Division, Department of Labor, held to be illegal "kickback" devices or an averaging of wages over two or more weeks designed to deprive employees of the minimum wage guaranteed by the Wage and Hour law. The opinion said that these efforts at evasion, made particularly in connection with the employment of learners in piecework industries, are illegal, "no matter how carefully veiled."

Republic Steel Complies With NLRB Order

PITTSBURGH — Republic Steel Corp.'s Union Drawn Steel Co., with plants at Beaver Falls, has posted notice that it is complying with a recent NLRB decree. The company has been ordered to withdraw recognition from an independent union, refrain from interfering with employees in the exercise of their rights to self-organization and to offer reinstatement which, if not available, places former employees on a preferential list of employment. The NLRB order was the outgrowth of labor difficulties in 1937.

Copperweld to Produce Alloy Steel by May 1

PITTSBURGH—Copperweld Steel Co. will start production of alloy steel at its new plant at Warren, Ohio, not later than May 1, according to S. E. Bramer, president. In making the company's earnings report public, Mr. Bramer said shipments from Glassport held up well during January and February.

Copperweld's net income for 1939 amounted to $934,348, equivalent after preferred dividends, to $2.05 a common share, compared with a revised net income of $619,853 in 1938.

Automobile Industry Consume

THE automobile industry in 1939 easily maintained its position as steel's most important customer, marking the eighth consecutive year in which more steel has been shipped to the automobile industry than to any other major industry in the country.

The construction industry in 1939 held its position as the second largest consumer of steel, followed by the railroads in third place.

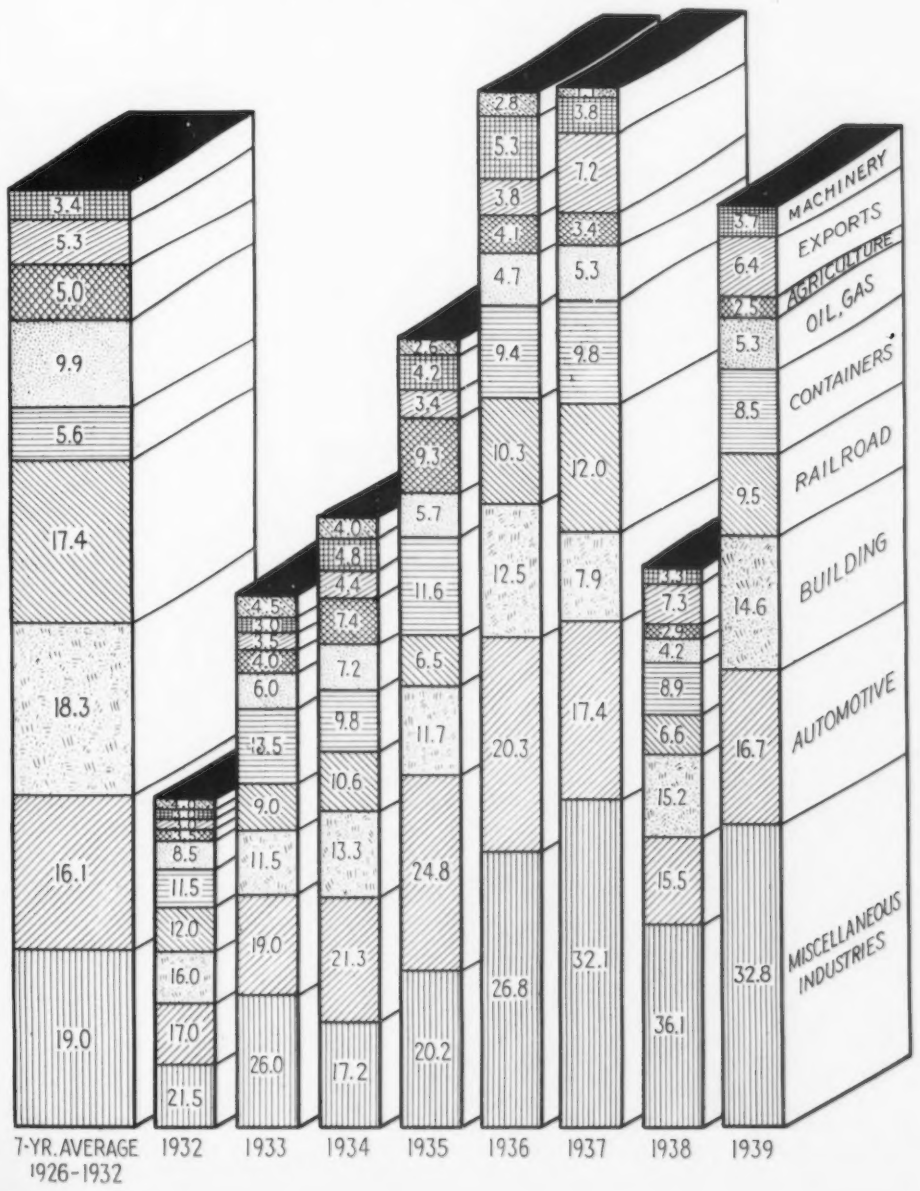
The details of the distribution of finished steel in 1939, shown in the accompanying compilation, are based on reports to THE IRON AGE from integrated steel companies having 96.4 per cent of the nation's ingot producing capacity. The distribution data presented herewith are expressed in net tons, instead of gross tons as in the past, to conform with the trend in the steel industry toward the use of the net ton basis. A large percentage of the companies making distribution reports for 1939 reported on a net ton basis. Data supplied on a gross ton basis were converted to net tons for the purpose of this tabulation. Reciprocals employed in making conversions were 0.89286 for net to gross, and 1.12 for gross to net.

To avoid duplication of shipments, reports of non-integrated companies are not included in the tabulation. However, an indication of the volume of the non-integrated mills' shipments can be found in the fact that the integrated mills reported shipping during the year for further conversion 537,664 net tons of skelp, 781,158 tons of sheet and tin bars and 1,318,121 tons of billets, blooms and slabs. Wire rods reported shipped for further conversion are included in the classification of wire products sold to wire manufacturers.

Actual shipments reported to THE IRON AGE for 1939 totaled 32,353,300 net tons. Adding to this figure the 2,636,944 tons of billets, blooms, slabs, skelp, and sheet and tin bars shipped for further conversion, gives a total of 34,990,244 net tons, or 31,241,389 gross tons.

In addition to having a slightly higher coverage than in the preceding

AGAIN in 1939 the automobile industry was the largest consumer of steel. The construction industry was the second largest, but the percentage going to this outlet in 1939 was a little less than in the preceding year. The railroads, in third place, took proportionately more steel in the past year than in 1938. Exports were off slightly on a percentage basis.



DISTRIBUTION OF ROLLED STEEL IN 1939 BASED ON S

INDUSTRY	Amount of Each Form: Rails	Track Accessories o
1. Steel converting and processing industries:		
(a) Wire manufacturers	.....	.....
(b) Bolt, nut, rivet and screw manufacturers	.....	.....
(c) Forging manufacturers	.....	.....
2. Jobbers, dealers and distributers (not including concrete bar fabricators)	17.6	44.3
3. Construction Industries:		
(a) Contractors, fabricators, etc.	7.4	1.7
(b) Concrete reinforcing bar fabricators	.....	.....
(c) Building material and equipment manufacturers	0.1	0.4
4. Shipbuilders	0.5	0.2
5. Pressing and forming industries:		
(a) Stamped and pressed steel products manufacturers	.....	.....
(b) Household equipment, including furniture, heating equipment, refrigerators, etc.	.....	.....
6. Container Industry	.....	.....
7. Agriculture, including implement and equipment manufacturers	.....	.....
8. Machinery and tool industry:		
(a) Electrical machinery and equipment manufacturers	.....	.....
(b) All other machinery and tools	1.5	0.1
9. Automotive industry	.....	.....
10. Railroads, including car and locomotive builders and parts manufacturers	1 117.6	539.5
11. Oil, gas, water and public utilities	16.7	5.9
12. Mining and lumbering industries	22.2	7.6
13. Miscellaneous industries	11.8	4.8
14. Exports	29.1	11.1
Total	1,224.5	615.6

DISTRIBUTION OF FINISHED STE

	1939 M. Tons	1939 Per Cent	1938 M. Tons	1938 Per Cent
Buildings and construction	4,729.4	14.6	3,011.5	15.2
Railroads	3,071.8	9.5	1,313.0	6.6
Automotive	5,396.2	16.7	3,068.7	15.5
Oil, gas, water, mining, etc.	1,740.3	5.3	827.0	4.2
Containers	2,741.7	8.5	1,756.2	8.9
Agriculture	796.1	2.5	570.8	2.9
Shipbuilding	489.4	1.5	331.8	1.7
Machinery and tools, including elec.	1,191.6	3.7	646.9	3.3
Exports	2,066.8	6.4	1,453.6	7.3
Highways	[1]		[1]	
All other consuming channels	10,130.0	31.3	6,792.4	34.4
Total	32,353.3		19,771.9	

[1] Included in Buildings and Construction. [2] Included in all other classifications.

DISTRIBUTION OF FINISH

	1939 M. Tons	1939 Per Cent	1938 M. Tons	1938 Per Cent
Rails	1,224.5	3.8	675.6	3.4
Plates	2,677.5	8.3	1,721.8	8.7
Tin plate and black plate	2,747.7	8.5	1,667.7	8.4
Other sheets	7,832.6	24.2	4,188.5	21.2
Strip	2,200.7	6.8	1,494.2	7.6
Wire products	3,078.0	9.5	1,989.2	10.1
Shapes	2,803.6	8.7	1,664.7	8.4
Bar, merchant	4,177.1	12.9	2,482.1	12.6
Bars, concrete	1,135.9	3.5	689.4	3.5
Pipe and tubing	2,750.8	8.5	1,852.1	9.4
Track accessories	615.6	1.9	266.0	1.3
All other finished products	1,109.3	3.4	1,080.6	5.4
Total	32,353.3		19,771.9	

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Actual shipments reported to THE IRON AGE for 1939 totaled 32,353,300 net tons. Adding to this figure the 2,636,944 tons of billets, blooms, slabs, skelp, and sheet and tin bars shipped for further conversion, gives a total of 34,990,244 net tons, or 31,241,389 gross tons.

In addition to having a slightly higher coverage than in the preceding year, the 1939 report apparently gives a more accurate distribution due to the revisions in classifying shipments. This more accurate distribution is reflected in a reduction in the miscellaneous classifications of both products and consuming channels.

No estimating has been done by THE IRON AGE in any of the figures presented herewith; they are exactly as reported by the steel companies. Nor has any allowance been made for the 3.6 per cent of capacity not reporting. There are several instances in the

RIBUTION OF ROLLED STEEL IN 1939 BASED ON SHIPMENTS OF COMPANIES HA CAPACITY

Amount of Each Form (in thousands of NET tons) Consumed by V

INDUSTRY	Rails	Track Accessories	Shapes over 3 in.	Plates	Bars and Shapes under 3 in.	Concrete Bars	Tin and Pl Ti
l converting and processing industries:							
Wire manufacturers	.....	.....	.....	.....	7.8	.....	...
Bolt, nut, rivet and screw manufacturers	.....	.....	0.2	.....	218.0	.....	...
Forging manufacturers	.....	.....	1.1	1.6	121.3	.....	...
bers, dealers and distributers (not including concrete r fabricators)	17.6	44.3	271.9	237.2	480.7	.....	
struction Industries:							
Contractors, fabricators, etc.	7.4	1.7	1,687.6	543.0	212.3	610.9	...
Concrete reinforcing bar fabricators	.....	.....	4.4	0.1	16.1	327.5	...
Building material and equipment manufacturers	0.1	0.4	29.2	39.3	88.3	13.3	
builders	0.5	0.2	76.4	316.5	33.2	0.8	
sing and forming industries:							
Stamped and pressed steel products manufacturers	.....	.....	2.1	89.7	52.1	19.2	
Household equipment, including furniture, heating equipment, refrigerators, etc.	.....	.....	5.1	8.7	75.2	.....	
tainer Industry	.....	.....	4.0	20.0	10.9	.....	2,
culture, including implement and equipment anufacturers	.....	.....	44.9	47.6	328.1	.....	...
hinery and tool industry:							
Electrical machinery and equipment manufacturers	.....	.....	28.5	36.4	53.0	.....	
All other machinery and tools	1.5	0.1	67.5	145.5	211.1	0.6	
motive industry	.....	.....	23.1	104.5	1,312.8	1.1	
roads, including car and locomotive builders and rts manufacturers	1,117.6	539.5	234.4	485.2	231.5	1.0	
gas, water and public utilities	16.7	5.9	78.8	93.2	24.5	23.0	
ng and lumbering industries	22.2	7.6	15.5	11.5	16.8	1.2	
ellaneous industries	11.8	4.8	80.9	198.5	548.2	18.3	
rts	29.1	11.1	148.0	299.0	135.2	119.0	
tal	1,224.5	615.6	2,803.6	2,677.5	4,177.1	1,135.9	2,7

DISTRIBUTION OF FINISHED STEEL BY CONSUMING CHANNELS

	1939 M. Tons	1939 Per Cent	1938 M. Tons	1938 Per Cent	1937 M. Tons	1937 Per Cent	1936 M. Tons	1936 Per Cent
gs and construction	4,729.4	14.6	3,011.5	15.2	2,878.4	7.9	4,480	12.5
ds	3,071.8	9.5	1,313.0	6.6	4,358.6	12.0	3,696	10.3
otive	5,396.2	16.7	3,068.7	15.5	6,330.2	17.4	7,280	20.3
, water, mining, etc.	1,740.3	5.3	827.0	4.2	1,919.1	5.3	1,680	4.7
ers	2,741.7	8.5	1,756.2	8.9	3,561.6	9.8	3,360	9.4
ture	796.1	2.5	570.8	2.9	1,254.0	3.4	1,456	4.1
lding	489.4	1.5	331.8	1.7	336.2	0.9	336	0.9
ery and tools, including elec.	1,191.6	3.7	646.9	3.3	1,370.4	3.8	1,904	5.3
	2,066.8	6.4	1,453.6	7.3	2,639.7	7.2	1,344	3.8
ys	[1]		[1]		398.6	1.1	1,008	2.8
r consuming channels	10,130.0	31.3	6,792.4	34.4	11,388.8	31.2	9,296	25.9
al	32,353.3		19,771.9		36,435.6		35,840	

[1] Included in Buildings and Construction. [2] Included in all other classifications.

DISTRIBUTION OF FINISHED STEEL BY PRODUCT (THO

	1939 M. Tons	1939 Per Cent	1938 M. Tons	1938 Per Cent	1937 M. Tons	1937 Per Cent	1936 M. Tons	1936 Per Cent
	1,224.5	3.8	675.6	3.4	1,539.3	4.2	1,316	3.7
	2,677.5	8.3	1,721.8	8.7	3,502.7	9.6	2,800	7.8
e and black plate	2,747.7	8.5	1,667.7	8.4	2,993.9	8.2	2,688	7.5
heets	7,832.6	24.2	4,188.5	21.2	8,019.5	22.0	7,840	21.9
	2,200.7	6.8	1,494.2	7.6	3,355.1	9.2	3,495	9.7
oducts	3,078.0	9.5	1,989.2	10.1	2,751.5	7.6	3,192	8.9
	2,803.6	8.7	1,664.7	8.4	3,001.6	8.2	2,744	7.7
rchant	4,177.1	12.9	2,482.1	12.6	4,924.1	13.5	4,816	13.4
ncrete	1,135.9	3.5	689.4	3.5	863.9	2.4	1,008	2.8
d tubing	2,750.8	8.5	1,852.1	9.4	3,464.6	9.5	3,416	9.5
ccessories	615.6	1.9	266.0	1.3	685.4	1.9	672	1.9
r finished products	1,109.3	3.4	1,080.6	5.4	1,334.0	3.7	1,859	5.2
al	32,353.3		19,771.9		36,435.6		35,840	

# of Rolled Steel Shipped in 1939

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1939 tabulation of apparent conflict with past years' data. However, careful investigation has indicated that in cases where this was not due to a contrary movement in the trend of the particular industry's operations, it can be traced to the more accurate distribution afforded by the present classifications.

There were few outstanding changes in the relative positions of the various consuming channels in 1939. The spread between the automobile and the construction industries was widened somewhat, while the proportion of steel being shipped abroad declined slightly. The railroads' share of the year's shipments increased a little over the 1938 figure, but was still substantially below the 1936 and 1937 levels.

Steel sold through jobbers in 1939 amounted to 4,742,900, not including products handled by concrete bar fabricators. If the tonnage handled by the concrete bar fabricators, 389,400 tons, was added to the jobber figure, the total, 5,132,300 tons, would repre-

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ANIES HAVING 96.4% OF THE NATIONAL INGOT PRODUCING

sumed by Various Industries

oncrete Bars	Tin Plate and Black Plate for Tinning	Galvanized Sheets	All Other Sheets	Strip Steel	Pipe and Tubing	Wire Products	All Other Finished Steel	Totals
.....	.....	.....	3.4	3.8	1.7	727.6	0.3	744.6
.....	.....	.....	.....	3.7	3.6	100.7	3.2	329.4
.....	.....	.....	0.4	1.8	1.6	0.8	0.3	128.9
.....	61.0	807.2	660.0	97.6	942.4	995.3	127.7	4,742.9
610.9	.....	94.7	180.0	24.8	53.3	83.9	48.2	3,547.8
327.5	.....	8.5	4.4	0.2	.....	27.2	1.0	389.4
13.3	7.3	97.9	147.0	65.2	117.2	128.3	58.7	792.2
0.8	0.1	3.6	8.5	0.8	15.0	8.6	25.2	489.4
19.2	27.0	51.0	155.7	163.3	3.0	54.3	6.3	623.7
.....	44.7	64.3	648.3	92.7	12.5	115.2	50.8	1,117.5
.....	2,108.2	22.4	432.0	82.4	0.6	39.4	21.8	2,741.7
.....	.....	46.3	78.8	71.9	28.8	121.7	28.0	796.1
.....	1.2	4.1	286.5	80.6	36.6	33.9	36.3	597.1
0.6	2.7	6.0	56.0	28.6	11.2	20.6	43.1	594.5
1.1	5.2	26.4	2,573.3	1,129.8	25.8	128.3	65.9	5,396.2
1.0	0.1	31.4	112.0	41.2	28.2	29.3	220.4	3,071.8
23.0	25.1	2.1	54.9	3.1	1,155.1	29.7	107.9	1,620.0
1.2	0.4	3.8	4.8	1.8	4.0	15.9	14.8	120.3
18.3	87.2	140.1	581.4	234.9	159.4	236.5	141.0	2,443.0
119.0	377.5	142.5	292.9	72.5	150.8	180.8	108.4	2,066.8
,135.9	2,747.7	1,552.3	6,280.3	2,200.7	2,750.8	3,078.0	1,109.3	32,353.3

HANNELS (THOUSANDS OF NET TONS)

36	1935		1934		1933		Seven-Year Aver. 1926-1932	
Per Cent	M. Tons	Per Cent	M. Tons	Per Cent	M. Tons	Per Cent	M. Tons	Per Cent
12.5	3,209	11.7	2,800	13.3	2,128	11.5	5,976	18.3
10.3	1,798	6.5	2,240	10.6	1,680	9.0	5,664	17.4
20.3	6,804	24.8	4,480	21.3	3,528	19.0	5,248	16.1
4.7	1,568	5.7	1,512	7.2	1,120	6.0	3,232	9.9
9.4	3,181	11.6	2,072	9.8	2,520	13.5	1,817	5.6
4.1	2,542	9.3	1,548	7.4	728	4.0	1,632	5.0
0.9	241	0.9	336	1.6	196	1.0	[2]	....
5.3	1,164	4.2	1,008	4.8	560	3.0	1,120	3.4
3.8	924	3.4	935	4.4	616	3.5	1,736	5.3
2.8	728	2.6	840	4.0	840	4.5	[2]	....
25.9	5,286	19.3	3,293	15.6	4,681	25.0	6,177	19.0
	27,445		21,064		18,597		32,602	

T (THOUSANDS OF NET TONS)

36	1935		1934		1933		Seven-Year Aver. 1926-1932	
Per Cent	M. Tons	Per Cent	M. Tons	Per Cent	M. Tons	Per Cent	M. Tons	Per Cent
3.7	784	2.9	1,130	5.4	466	2.5	2,372	7.3
7.8	1,904	6.9	1,610	7.6	1,299	7.0	3,728	11.4
7.5	2,352	8.6	1,945	9.1	2,199	11.8	1,765	5.4
21.9	5,824	21.2	3,576	17.0	3,455	18.6	4,446	13.6
9.7	3,808	13.9	2,548	12.1	2,160	11.6	2,313	7.1
8.9	2,688	9.8	1,929	9.2	2,267	12.2	2,733	8.4
7.7	1,792	6.5	1,598	7.6	1,242	6.7	3,687	11.3
13.4	4,564	16.6	3,035	14.4	2,514	13.5	4,855	14.9
2.8	560	2.0	543	2.6	413	2.2	866	2.7
9.5	2,240	8.2	2,124	10.1	1,734	9.3	2,940	9.0
1.9	364	1.3	392	1.9	224	1.2	727	2.2
5.2	565	2.1	634	3.0	624	3.4	2,170	6.7
	27,445		21,064		18,597		32,602	

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year, the 1939 report apparently gives a more accurate distribution due to the revisions in classifying shipments. This more accurate distribution is reflected in a reduction in the miscellaneous classifications of both products and consuming channels.

No estimating has been done by THE IRON AGE in any of the figures presented herewith; they are exactly as reported by the steel companies. Nor has any allowance been made for the 3.6 per cent of capacity not reporting. There are several instances in the 1939 tabulation of apparent conflict with past years' data. However, careful investigation has indicated that in cases where this was not due to a contrary movement in the trend of the particular industry's operations, it can be traced to the more accurate distribution afforded by the present classifications.

There were few outstanding changes in the relative positions of the various consuming channels in 1939. The spread between the automobile and the construction industries was widened somewhat, while the prop steel being shipped abroad slightly. The railroads' sha year's shipments increased a the 1938 figure, but was stantially below the 1936 levels.

Steel sold through jobber amounted to 4,742,900, not products handled by con fabricators. If the tonnage the concrete bar fabricator tons, was added to the jobl the total, 5,132,300 tons, wo

SED ON SHIPMENTS OF COMPANIES HAVING 96.4% OF THE NATIONAL INGOT PRODUCING CAPACITY

t of Each Form (in thousands of NET tons) Consumed by Various Industries

	Track Accessories	Shapes over 3 in.	Plates	Bars and Shapes under 3 in.	Concrete Bars	Tin Plate and Black Plate for Tinning	Galvanized Sheets	All Other Sheets	Strip Steel	Pipe and Tubing	Wire Products	All Other Finished Steel	Totals
.	.....	.....	.....	7.8	.....	.....	.....	3.4	3.8	1.7	727.6	0.3	744.6
.	.....	0.2	.....	218.0	.....	.....	.....	.....	3.7	3.6	100.7	3.2	329.4
.	.....	1.1	1.6	121.3	.....	.....	.....	0.4	1.8	1.6	0.8	0.3	128.9
6	44.3	271.9	237.2	480.7	.....	61.0	807.2	660.0	97.6	942.4	995.3	127.7	4,742.9
4	1.7	1,687.6	543.0	212.3	610.9	.....	94.7	180.0	24.8	53.3	83.9	48.2	3,547.8
.	.....	4.4	0.1	16.1	327.5	.....	8.5	4.4	0.2	.....	27.2	1.0	389.4
1	0.4	29.2	39.3	88.3	13.3	7.3	97.9	147.0	65.2	117.2	128.3	58.7	792.2
5	0.2	76.4	316.5	33.2	0.8	0.1	3.6	8.5	0.8	15.0	8.6	25.2	489.4
.	.....	2.1	89.7	52.1	19.2	27.0	51.0	155.7	163.3	3.0	54.3	6.3	623.7
.	.....	5.1	8.7	75.2	.....	44.7	64.3	648.3	92.7	12.5	115.2	50.8	1,117.5
.	.....	4.0	20.0	10.9	.....	2,108.2	22.4	432.0	82.4	0.6	39.4	21.8	2,741.7
.	.....	44.9	47.6	328.1	.....	.....	46.3	78.8	71.9	28.8	121.7	28.0	796.1
.	.....	28.5	36.4	53.0	.....	1.2	4.1	286.5	80.6	36.6	33.9	36.3	597.1
5	0.1	67.5	145.5	211.1	0.6	2.7	6.0	56.0	28.6	11.2	20.6	43.1	594.5
.	.....	23.1	104.5	1,312.8	1.1	5.2	26.4	2,573.3	1,129.8	25.8	128.3	65.9	5,396.2
3	539.5	234.4	485.2	231.5	1.0	0.1	31.4	112.0	41.2	28.2	29.3	220.4	3,071.8
7	5.9	78.8	93.2	24.5	23.0	25.1	2.1	54.9	3.1	1,155.1	29.7	107.9	1,620.0
2	7.6	15.5	11.5	16.8	1.2	0.4	3.8	4.8	1.8	4.0	15.9	14.8	120.3
8	4.8	80.9	198.5	548.2	18.3	87.2	140.1	581.4	234.9	159.4	236.5	141.0	2,443.0
1	11.1	148.0	299.0	135.2	119.0	377.5	142.5	292.9	72.5	150.8	180.8	108.4	2,066.8
5	615.6	2,803.6	2,677.5	4,177.1	1,135.9	2,747.7	1,552.3	6,280.3	2,200.7	2,750.8	3,078.0	1,109.3	32,353.3

HED STEEL BY CONSUMING CHANNELS (THOUSANDS OF NET TONS)

1938		1937		1936		1935		1934		1933		Seven-Year Aver. 1926-1932	
M. Tons	Per Cent	M. Tons	Per Cent	M. Tons	Per Cent	M. Tons	Per Cent	M. Tons	Per Cent	M. Tons	Per Cent	M. Tons	Per Cent
11.5	15.2	2,878.4	7.9	4,480	12.5	3,209	11.7	2,800	13.3	2,128	11.5	5,976	18.3
13.0	6.6	4,358.6	12.0	3,696	10.3	1,798	6.5	2,240	10.6	1,680	9.0	5,664	17.4
68.7	15.5	6,330.2	17.4	7,280	20.3	6,804	24.8	4,480	21.3	3,528	19.0	5,248	16.1
27.0	4.2	1,919.1	5.3	1,680	4.7	1,568	5.7	1,512	7.2	1,120	6.0	3,232	9.9
56.2	8.9	3,561.6	9.8	3,360	9.4	3,181	11.6	2,072	9.8	2,520	13.5	1,817	5.6
70.8	2.9	1,254.0	3.4	1,456	4.1	2,542	9.3	1,548	7.4	728	4.0	1,632	5.0
31.8	1.7	336.2	0.9	336	0.9	241	0.9	336	1.6	196	1.0	[2]	....
46.9	3.3	1,370.4	3.8	1,904	5.3	1,164	4.2	1,008	4.8	560	3.0	1,120	3.4
53.6	7.3	2,639.7	7.2	1,344	3.8	924	3.4	935	4.4	616	3.5	1,736	5.3
		398.6	1.1	1,008	2.8	728	2.6	840	4.0	840	4.5	[2]	....
92.4	34.4	11,388.8	31.2	9,296	25.9	5,286	19.3	3,293	15.6	4,681	25.0	6,177	19.0
71.9		36,435.6		35,840		27,445		21,064		18,597		32,602	

ssifications.

F FINISHED STEEL BY PRODUCT (THOUSANDS OF NET TONS)

1938		1937		1936		1935		1934		1933		Seven-Year Aver. 1926-1932	
M. Tons	Per Cent	M. Tons	Per Cent	M. Tons	Per Cent	M. Tons	Per Cent	M. Tons	Per Cent	M. Tons	Per Cent	M. Tons	Per Cent
75.6	3.4	1,539.3	4.2	1,310	3.7	784	2.9	1,130	5.4	466	2.5	2,372	7.3
21.8	8.7	3,502.7	9.6	2,800	7.8	1,904	6.9	1,610	7.6	1,299	7.0	3,728	11.4
37.7	8.4	2,993.9	8.2	2,688	7.5	2,352	8.6	1,945	9.1	2,199	11.8	1,765	5.4
88.5	21.2	8,019.5	22.0	7,840	21.9	5,824	21.2	3,576	17.0	3,455	18.6	4,446	13.6
94.2	7.6	3,355.1	9.2	3,495	9.7	3,808	13.9	2,548	12.1	2,160	11.6	2,313	7.1
89.2	10.1	2,751.5	7.6	3,192	8.9	2,688	9.8	1,929	9.2	2,267	12.2	2,733	8.4
54.7	8.4	3,001.6	8.2	2,744	7.7	1,792	6.5	1,598	7.6	1,242	6.7	3,687	11.3
82.1	12.6	4,924.1	13.5	4,816	13.4	4,564	16.6	3,035	14.4	2,514	13.5	4,855	14.9
89.4	3.5	863.9	2.4	1,008	2.8	560	2.0	543	2.6	413	2.2	866	2.7
52.1	9.4	3,464.6	9.5	3,416	9.5	2,240	8.2	2,124	10.1	1,734	9.3	2,940	9.0
66.0	1.3	685.4	1.9	672	1.9	364	1.3	392	1.9	224	1.2	727	2.2
80.6	5.4	1,334.0	3.7	1,859	5.2	565	2.1	634	3.0	624	3.4	2,170	6.7
71.9		**36,435.6**		35,840		27,445		21,064		18,597		32,602	

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Compiled by THE IRON AGE

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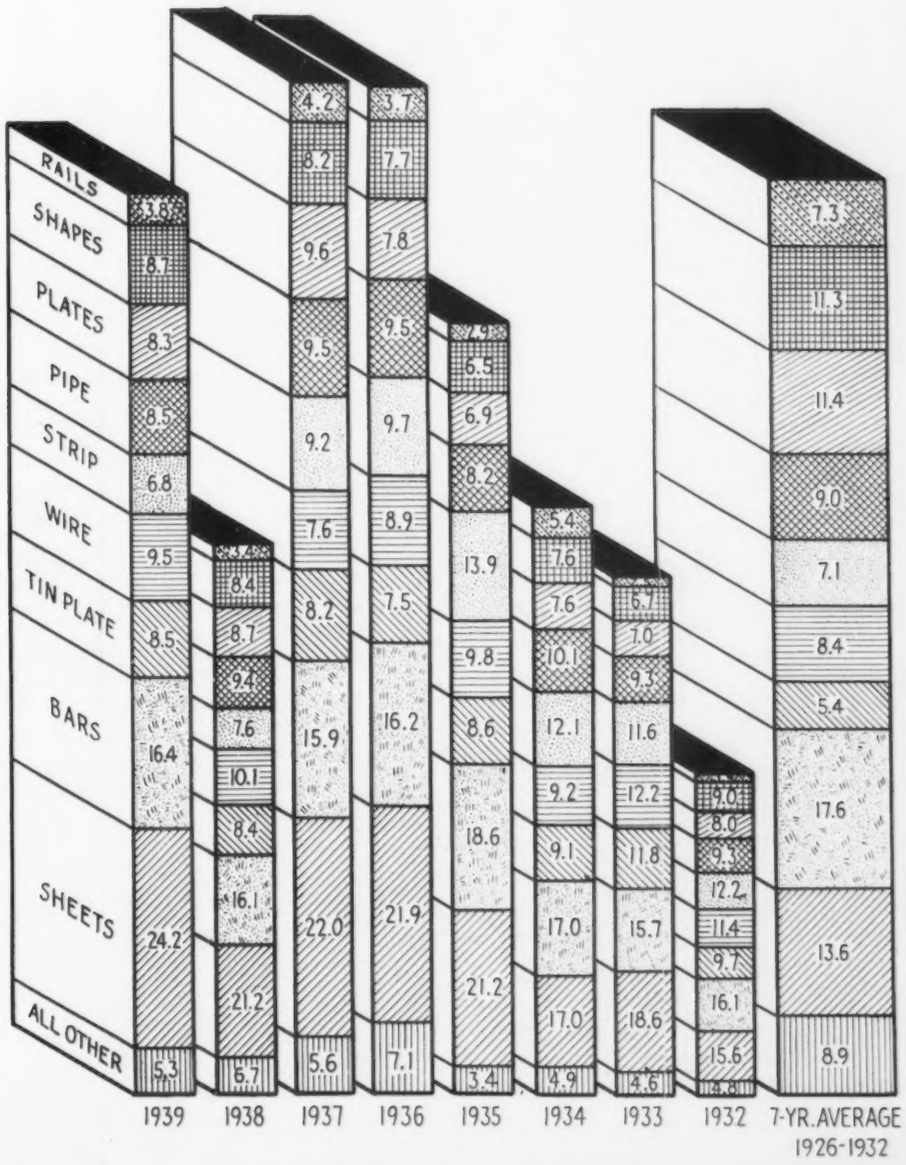
sent close to 16 per cent of all shipments. This percentage is almost identical with that of 1938.

In addition to showing a breakdown, by both product and outlet, from 1932 to 1939, an average of the seven years from 1926 to and including 1932, is also given. This period covers both the high production of 1929 and the low output of 1932 and is thus particularly valuable in determining "average" data with respect to both product and distribution. The average yearly shipments in that period were very close to the 1939 figure, but sharp changes are shown in the proportion of steel consumed by the various industries. This is particularly true of railroad consumption. In the 1926-32 period, the carriers accounted for 17.4 per cent of the year's shipments, while in 1939 their share was only 9.5. This reduction in railroad demand is further shown by the decline in rail shipments from 7.3 in the seven-year period to 3.8 in 1939.

SHEETS, exclusive of black plate and tin plate, accounted for almost one-fourth of all shipments in 1939, as compared with 13.6 per cent in the seven-year period 1926-32. Proportion of shipments of lighter steel products—sheets, strip, wire, bars, black plate and tin plate—to total shipments increased to 65.4 in 1938 from 63.4 in previous year.



. . . OBITUARY . . .

DAVID C. JONES, vice-president and general manager of the Lunkenheimer Co., Cincinnati, died March 11. He was 63 years old and joined company as a timekeeper 43 years ago. He was a past president of the American Supply and Machinery Manufacturers' Association.

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DANIEL J. MOLONEY, SR., 67, former superintendent of Lakeside plant of Otis Steel Co., Cleveland, and an employee of the company more than 30 years, died March 10 in Chicago. Mr. Moloney moved to Chicago 10 years ago to work for his son, Ray T. Moloney, president of Bally Mfg. Co., maker of amusement devices. He was production manager of the company until he became ill a year ago.

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MELVIN L. WILCOX, 78 years old, a pioneer in the automotive parts business, died March 12 at Jacksonville, Fla., where he was spending the winter. Products designed and developed by Mr. Wilcox formed the basis of two major automotive supply concerns. His invention of a steering gear led eventually to the organization of what is now the Saginaw Steering Gear Division of General Motors Corp. and patents on automotive parts formed the basis of the Wilcox-Rich Division of the Eaton Co.

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JOSEPH E. BROWN, manager of the Reed Foundry & Machine Co., Kalamazoo, Mich., for many years, and an officer and director of other Michigan industries, was buried March 15 at Kalamazoo. Born in Georgia in 1865, he was in business in Atlanta until 1903 when he went to Michigan following the death of his father-in-law, Heber Reed, founder of the Reed company.

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CLARENCE I. VELLNER, engineer in the Dodge division of the Chrysler Corp., was buried March 9 at Detroit. Mr. Vellner was born in St. Louis, Mo., 47 years ago and went to Detroit 20 years ago.

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PETER J. REDMOND, 78 years old, secretary-treasurer of the Valley Grey Iron Foundry, Saginaw, Mich., was buried March 9. Mr. Redmond died suddenly at his desk.

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WILLIAM BRABANT, shop superintendent of the Brabant Brass Mfg. Co., died March 12 at Detroit. He was born in Wallaceburg, Ont., 63 years ago, and had lived in Detroit since boyhood.

MARTIN H. WELCH, superintendent of a blast furnace shift at the Ford Motor Co. and nationally known in the iron industry, died from a heart attack at his work on March 8. He collapsed in his office at the Ford Motor Co. Rouge plant. Born in Youngstown on Nov. 10, 1867, Mr. Welch became known widely as first operator of a blast furnace for 100 per cent Mesaba iron range ore and is credited with markedly increasing the possible daily output of iron. Mr. Welch went to Detroit in 1920 to work for the Ford Motor Co.

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COL. EDWIN W. M. BAILEY, widely known in the automotive industry as president of Bailey Co., Inc., Amesbury, Mass., an automotive parts firm, died March 8. Colonel Bailey, 77 years old, became connected with the firm in 1880 when it built carriages, and guided its transition to the manufacture of specialized automotive products. He died while vacationing at Barbados, British West Indies.

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JOHN H. SULLIVAN, 68, president of the Sullivan-Becker Machine Co., Kenosha, Wis., died at a Kenosha hospital March 4 following a long illness. Regarded as an expert machinist throughout the Middle West, Mr. Sullivan became identified with the industry as a youth with the old Chicago-Kenosha Watch Case Company, later joining the Sterling Bicycle Co., after which he was associated with the tool department of the J. I. Case Co. in Racine. In 1923 he organized the machine company.

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ANTHONY L. WASHTAK, owner of Union Welding & Machine Co., Cleveland, died March 7, aged 51 years.

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CHRISTIAN SCHEIK, former foundry superintendent for the Milwaukee Road for 30 years and for the National Brake & Electric Co. for 20 years, died at his home in Milwaukee at the age of 78 years. He was a native of Germany and went to Milwaukee as a child.

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FRANKLIN B. GIESLER, president of the Normann-Duffke Co., and former manager of the Galland-Henning Mfg. Co., Milwaukee, died at his home there March 14 at the age of 87 years after a long illness. He was born in Chicago and went to Milwaukee at an early age. At one time he was chief engineer of the Milwaukee Water Department.

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CHARLES W. NELSON, engineer for the American Appraisal Co., Milwaukee, for 30 years, died at his home in Wauwautoso, Wis., March 13, after a year's illness.

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LOUIS H. GLOE, auditor and purchasing agent for the Leyse Aluminum Co., Kewaunee, Wis., died at a Milwaukee sanitarium March 11 after an illness of 10 days. He was a native of Two Rivers, Wis., and moved to Kewaunee in 1919.

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CARL A. SWANSTROM, president of the Elastic Stop-Nut Corp. and director of the American Gas Accumulator Co., both of Elizabeth, N. J., died after a long illness on March 11, aged 44 years. He was born in Sweden and came to this country as a young man. After several years of service as an engineer in the steel industry, he developed the self-locking nut made by the company of which he was the head.

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JOHN F. KIRBY, superintendent of the Somerville Iron Works, Somerville, N. J., died on March 13. He had been identified with the company for 33 years.

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EPHRAIM A. SCHWARZENBERG, Cleveland scrap iron and steel broker for 52 years and one of the originators of the plan to organize an institute for his industry, died suddenly March 17 while on vacation at Miami Beach, Fla. A native of Cleveland, he entered the scrap iron and steel business under his father, Louis H. Schwarzenberg, who went to Cleveland in 1840. Mr. Schwarzenberg was long active in the Cleveland chapter of the Institute of Scrap Iron and Steel, Inc., and was a member of the board of trustees at the time of his death. He was honored last winter at a testimonial dinner in Cleveland for his long service to his industry.

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JULIAN B. GREENSTREET, general manager of Textile Machine Works, Reading, Pa., died at his home on March 10, aged 54 years.

Argentine Government Studies Steel Making in U. S.

PITTSBURGH — The Argentine Government, through an army commission, is studying steel making in general in this country, as well as purchasing equipment and material for its steel plant in Buenos Aires. The commission is represented here by Major Arthur R. von Wulffen, 1013 Bessemer Building, who has been in this country for the past several months.

Decline in Steel Imports Continues

WASHINGTON—Representing a decline for the fourth consecutive month, iron and steel imports, excluding scrap, for January totaled 7832 tons valued at $920,533 as compared with 13,442 tons valued at $1,099,177 in December, 1939. January, 1939, figures were 24,331 tons valued at $1,729,145.

According to preliminary figures compiled by the Commerce Department's Metals and Minerals Division, the 5610-ton decline recorded for January, 1940, trade was more than accounted for by the drop in receipts of spiegeleisen, from 5767 tons to only 78 tons; while lesser reductions in the receipts of other products were offset by increases such as took place in the trade in ferro-manganese, 1285 tons in December to 1945 tons in January; and in pig iron, 1318 tons to 1914 tons.

The leading source of January imports was Sweden whose total of 2515 tons included 963 tons of wire rods. Virtually all—1945 tons—of the 1996-ton trade with Norway was ferromanganese, while pig iron comprised all of the 1599 tons reported received from British India. Imports from Canada totaled but 689 tons, while receipts from Belgium reached the low figure of but 667 tons.

Imports of scrap also declined in January to 442 tons valued at $4423 from the December figure of 1267 tons valued at $15,473. In January, 1939, this trade had amounted to 3333 tons valued at $30,707. Mexico was the source of 289 tons, and Canada 99 tons, ont of a total of 442 tons in January.

Exports of Iron and Steel from the United States

(In Gross Tons)

	January 1940	January 1939
Pig iron	15,057	6,325
Ferromanganese and spiegeleisen	408	....
Other ferroalloys	747	103
Scrap, iron and steel	185,653	225,434
Scrap, tin plate	795	1,639
Waste-waste tin plate and terneplate clippings*	1,029	811
Pig iron, ferroalloys and scrap	*203,669*	*234,312*
Ingots, blooms, billets, sheet bars	58,194	13,366
Ingots, etc., alloy steel, incl. stainless	2,608	981
Skelp	8,535	742
Wire rods	9,295	353
Semi-finished steel	*78,632*	*15,442*
Bars, plain and reinforcing	44,882	10,682
Bars, alloy steel	1,600	1,352
Bars, stainless steel	80	11
Iron bars	1,449	61
Plates, plain and fabricated	24,065	11,016
Plates, alloy steel	173	38
Plates, stainless	4	3
Sheets, galvanized steel	16,001	7,326
Sheets, galvanized iron	984	429
Sheets, black, plain steel	30,569	24,268
Sheets, alloy steel	562	347
Sheets, stainless	241	52
Sheets, black iron	2,494	576
Hoops, bands, strips, plain steel	18,096	7,057
Hoops, bands, strip steel alloy	75	12
Hoops, bands, strip steel, stainless	100	156
Tin plate and taggers' tin	64,301	12,670
Terne plate (incl. long ternes)	627	158
Structural shapes, plain material	14,529	5,404
Structural material, fabricated	7,054	1,459
Sheet piling	1,971	167
Tanks, steel	1,975	1,442
Steel rails	5,829	3,179
Rail fastenings, switches, spikes, etc.	1,622	1,005
Boiler tubes	1,759	393
Casing and oil line pipe	19,021	4,263
Pipe, black and galvanized, welded steel	7,592	2,686
Pipe, black and galv., welded iron	1,144	695
Plain and galvanized wire	9,746	4,140
Brabed wire and woven wire products	3,099	2,729
Wire rope and other products	2,077	858
Nails and tacks	5,881	1,916
Bolts, nuts, rivets and washers except track	1,081	586
Other finished steel	2,691	416
Rolled and finished steel	*293,356*	*107,552*
Cast iron pipe and fittings	3,036	2,774
Malleable iron screwed fittings	498	309
Carwheels and axles	959	1,385
Castings, iron and steel	878	415
Castings, alloy steel, incl. stainless	200	78
Forgings, plain	2,006	397
Forgings, alloy steel, incl. stainless	287	8
Castings and forgings	*7,864*	*5,366*
Total	583,521	362,672

*New class.

Imports

(In Gross Tons)

	January 1940	January 1939
Pig iron	1,914	586
Sponge iron	12	34
Ferromanganese[1]	1,945	3,150
Spiegeleisen	78	976
Ferrochrome[2]	....	....
Ferrosilicon[3]	269	74
Other ferroalloys[4]	50	25
Scrap	442	3,333
Pig iron, ferroalloys and scrap	*4,710*	*10,829*
Steel ingots, blooms, etc.	....	1
Billets, whether solid or hollow	204	7
Wire rods	1,037	1,196
Semi-finished steel	*1,241*	*1,204*
Concrete reinforcement bars	....	365
Hollow and steel bars	189	100
Merchant steel bars	400	2,188
Iron slabs	....	....
Iron bars	85	50
Boiler and other plate (including skelp)	1	....
Sheets, skelp, and saw plate	8	171
Die blocks or blanks, etc.	....	....
Tin plate	3	3
Structural shapes	216	3,534
Sashes and frames	....	....
Sheet piling	....	....
Rails and track material	109	241
Welded pipe	....	270
Other pipe	412	6,550
Cotton ties	....	2
Other hoops and bands	305	1,894
Barbed wire	....	1,012
Round iron and steel wire	200	285
Telegraph and telephone wire	....	1
Flat wire and steel strips	230	270
Wire rope and strand	81	240
Other wire	....	240
Nails, tacks, and staples	38	553
Bolts, nuts, and rivets	5	12
Horse and mule shoes	3	45
Rolled and finished steel	*2,285*	*18,680*
Malleable iron pipe fittings	....	....
Cast-iron pipe and fittings	....	32
Castings and forgings	38	224
Total	8,274	27,664

[1] Manganese content; [2] chrome content; [3] silicon content; [4] alloy content respectively.

Scrap Consumption in U. S. Off 19% in February

DOMESTIC consumption of iron and steel scrap declined 19 per cent in February to 3,054,000 gross tons, according to the Institute of Scrap Iron and Steel, Inc., New York. This compares with 3,775,000 tons melted in January and 2,313,000 tons in February, 1939.

In the first two months of this year domestic consumption of scrap has totaled 6,829,000 tons, against 4,808,000 tons in the corresponding period of 1939, and 2,637,000 tons in the same period of 1938.

Exports of iron and steel scrap continue to decline, the January total of 187,457 being the smallest in 16 months, ore since September, 1938. Current ratio of domestic consumption of scrap to exports is about 16 to 1, the Institute reports.

United States Imports of Pig Iron by Countries of Origin

(In Gross Tons)

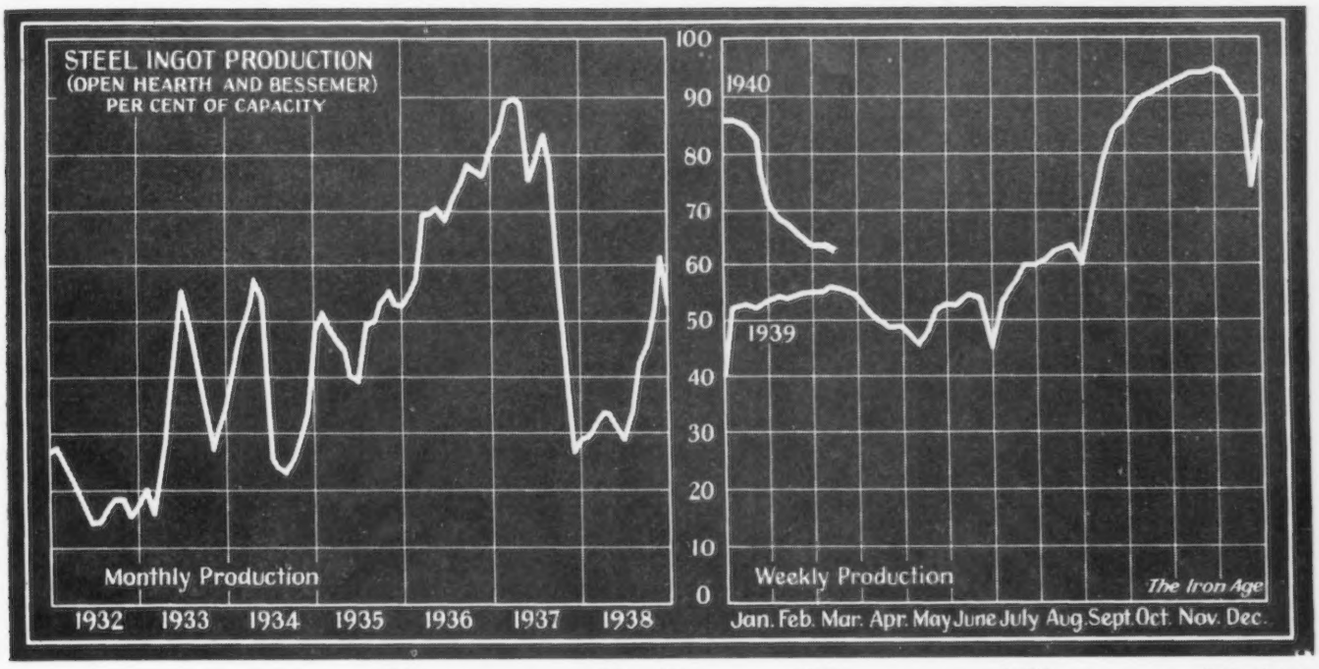
	January 1940	January 1939
United Kingdom	....	....
British India	1,599	202
Germany	....	....
Netherlands	....	222
Canada	315	162
France	....	....
Belgium	....	....
Norway	....	....
Sweden	....	....
Russia	....	..
All others	....	....
Total	1,914	586

Imports of Iron and Manganese Ores

(In Gross Tons)

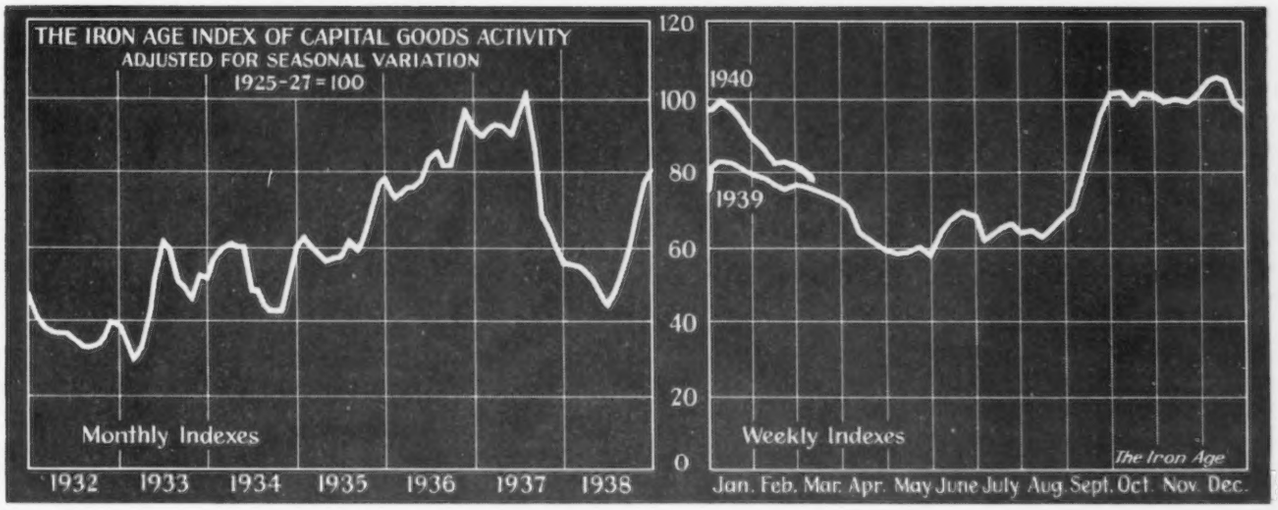
	Iron Ore		Manganese Concentrates, 35 Per Cent or Over	
	1940	1939	1940	1939
Canada	....	60	....	13
Cuba	31,700	35,003	2,659	2,843
Chile	141,500	118,500	....	23
Spain	....	....	....	....
Norway	....	14,944	....	....
Sweden	36,072	7,080	....	....
French Africa	....	....	....	....
Russia	....	....	17,501	3,250
India	....	....	2,982	....
Brazil	....	....	5,368	....
Gold Coast	....	....	8,961	1,849
Other countries	149	4,124	1,938	1,688
Total	209,421	179,711	39,409	9,666

Ingot Rate Drops One Point to 62½% of Capacity



District Ingot Production, Per Cent of Capacity	Pitts-burgh	Chicago	Valleys	Phila-delphia	Cleve-land	Buffalo	Wheel-ing	Detroit	Southern	S. Ohio River	Western	St. Louis	East-ern	Aggre-gate
CURRENT WEEK..	58.0	59.5	44.0	63.0	70.0	51.5	68.0	82.5	78.0	51.0	70.0	58.5	90.0	**62.5**
PREVIOUS WEEK..	56.0	59.0	44.0	63.0	72.0	51.5	82.0	82.5	80.0	55.0	70.0	61.5	90.0	**63.5**

Capital Goods Index Sinks to 77.9



WITH the one exception of the automobile industry, there was no evidence visible in the past week that the production schedules of the durable goods industries had yet felt the stimulus of the usual spring demand. In most of the industries represented by the index, physical output for the week was little altered from the preceding week, but after adjustment against a rising seasonal trend, four series lost ground. Automobile production gained slightly in the week, but not sufficiently to satisfy the requirements of the seasonal factor. The combined index for the week ended March 16 was 77.9, down 2.1 points from the preceding week and the lowest index since the second week of September, a year ago.

	Week Ended Mar. 16	Week Ended Mar. 9	Comparable Week 1939	Comparable Week 1929
Steel ingot production[1]	81.7	82.4	72.3	118.4
Automobile production[2]	100.4	103.2	82.3	127.5
Construction contracts[3]	60.1	62.8	96.0	143.0
Forest products carloadings[4]	57.6	59.0	47.3	115.6
Production and shipments, Pittsburgh District[5]	89.9	92.8	72.2	116.5
Combined index	**77.9**	**80.0**	**74.0**	**124.2**

Sources: [1] THE IRON AGE; [2] Ward's Automotive Reports; [3] *Engineering News-Record;* [4] Association of American Railroads; [5] University of Pittsburgh. The indexes of forest products carloadings and activity in the Pittsburgh area reflect conditions as of the week ending March 9. Other indexes cover the week of March 16.

. . . SUMMARY OF THE WEEK . . .

. . . Increase in number of orders suggests upturn is on way.

° ° °

. . . Steel operations decline a point to 62½ per cent.

° ° °

. . . Iron Age scrap composite price drops 17c. to $16.54.

AN increase this week in the number of steel orders being placed suggests to producers that the steel market is broadening somewhat, even though the total tonnage involved shows little improvement.

Ingot output, however, slipped another point to 62½ per cent, the lowest rate of the year so far, and mill schedules continue at a level considerably higher than can be supported by the incoming volume of new business. Operations in the Pittsburgh district have gained two points to 58 per cent, marking a reversal of the trend in that important area, and Chicago production is up a half point to 59½ per cent, but advances in those centers are more than offset by a 14-point decline to 68 per cent in the Wheeling-Weirton area, a 2-point drop to 58 per cent at Cleveland, a 2-point drop to 78 per cent in the Southern district, and a 3-point loss to 58½ per cent at St. Louis.

The factors influencing the steel industry trend at this time are varied and numerous with the European war, the coming election, an unusually severe winter followed by a late spring, and doubts as to the legislative outlook such as the outcome of efforts to reorganize the National Labor Relations Board, all combining to increase business uncertainty.

SIGNS of improvement, however, can be seen. Export sales continue to expand, even though some of this business is being obtained at the expense of prices, which on some exported products have continued to decline for the past two weeks. Pig iron exports have reached a level where sellers are seeking to arrange for full cargoes but are facing a lack of ship space. Steel exports so far in March are running ahead of February and business from abroad is contributing more each day to maintenance of steel plant schedules.

A steady flow of small fill-in orders is going from automobile plants to the mills, and Ford Motor Co. is expected to enter the market shortly for 15,000 to 20,000 tons of steel needed for an increase in its production schedule before June 1.

RAILROAD buying continues light, with the emphasis on motive power purchases. Delaware, Lackawanna & Western has ordered 11 diesel-electric switchers from the Electro-Motive Corp., and three similar units from American Locomotive Co. With even moderately good earnings this year, the nation's railroads are expected to order from 50,000 to 70,000 cars.

Other normally large steel consuming outlets, like the construction industry, continue to lag, partly because of cold weather. Prospects for a revived PWA, said to be advocated in some quarters to lift employment in an election year, are reported from Washington. Meanwhile, the volume of structural steel awards has risen this week to 13,750 tons from 9900 tons last week. The largest awards are 3300 tons for a Boston Navy Yard building, 2580 tons for the Fort Hamilton high school, Brooklyn, 1500 tons for Navy buildings at Midway Island in the Pacific, and 1200 tons for a Sears, Roebuck & Co. warehouse at Chicago. New structural steel projects declined to 8700 tons from 11,600 tons last week.

REINFORCING steel lettings likewise show a moderate gain, reaching 14,250 tons from 9450 tons last week, the total including 3750 tons for the Sepulveda Dam at Los Angeles, 2500 tons for a reservoir at Toledo, Ohio, and 1051 tons for the Grand Coulee Dam in Washington. New reinforcing steel projects declined to 11,100 tons from 14,700 tons a week earlier, the new jobs including 4750 tons for Los Angeles River improvements and 2650 tons for the Shasta Dam powerplant.

Reinforcing bar prices continue weak. Manufacturers of rail steel reinforcing bars have reestablished a differential between this product and new billet steel reinforcing bars. A similar differential has been established on rail steel merchant bars and new billet bars.

Meanwhile THE IRON AGE steel scrap composite price has dropped 17c. to $16.54, the first move from the $16.71 level since Feb. 20. Last week's weakness in railroad grades at Pittsburgh has spread. At Chicago the scrap market is softer and the entire list has been lowered 25c. a ton. THE IRON AGE capital goods index has dropped 2.1 points to 77.9 per cent of the 1925-27 base, the lowest level touched by the index since the second week of September, 1939.

A Comparison of Prices

Market Prices at Date, and One Week, One Month, and One Year Previous
Advances Over Past Week in Heavy Type, Declines in Italics

Rails and Semi-finished Steel

Per Gross Ton:	Mar. 19, 1940	Mar. 12, 1940	Feb. 20, 1940	Mar. 21, 1939
Rails, heavy, at mill	$40.00	$40.00	$40.00	$40.00
Light rails: Pittsburgh, Chicago, Birmingham	40.00	40.00	40.00	40.00
Rerolling billets: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point	34.00	34.00	34.00	34.00
Sheet bars: Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point	34.00	34.00	34.00	34.00
Slabs: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point	34.00	34.00	34.00	34.00
Forging billets: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham	40.00	40.00	40.00	40.00
Wire rods: Nos. 5 to 9/32 in., Pittsburgh, Chicago, Cleveland, cents per lb.	2.00	2.00	2.00	1.92
Skelp, grvd. steel: Pittsburgh, Chicago, Youngstown, Coatesville, Sparrows Point, cents per lb.	1.90	1.90	1.90	1.90

Finished Steel

Cents Per Lb.:				
Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham	2.15	2.15	2.15	2.25
Plates: Pittsburgh, Chicago, Gary, Birmingham, Sparrows Point, Cleveland, Youngstown, Coatesville, Claymont	2.10	2.10	2.10	2.10
Structural shapes: Pittsburgh, Chicago, Gary, Buffalo, Bethlehem, Birmingham	2.10	2.10	2.10	2.10
Alloy bars: Pittsburgh, Buffalo, Bethlehem, Massillon or Canton	2.70	2.70	2.70	2.80
Cold finished bars: Pittsburgh, Buffalo, Cleveland, Chicago, Gary	2.65	2.65	2.65	2.70
Hot rolled strip: Pittsburgh, Chicago, Gary, Cleveland, Middletown, Youngstown, Birmingham	2.10	2.10	2.10	2.15
Cold rolled strip: Pittsburgh, Cleveland, Youngstown	2.80	2.80	2.80	2.95
Sheets, galv., No. 24; Pittsburgh, Gary, Sparrows Point, Buffalo, Middletown, Youngstown, Birmingham.	3.50	3.50	3.50	3.50
Hot rolled sheets: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Sparrows Point, Cleveland, Youngstown, Middletown	2.10	2.10	2.10	2.15
Cold rolled sheets: Pittsburgh, Chicago, Gary, Buffalo, Youngstown, Cleveland, Middletown	3.05	3.05	3.05	3.20
Wire nails: Pittsburgh, Chicago, Cleveland, Birmingham	2.55	2.55	2.55	2.45
Plain wire: Pittsburgh, Chicago, Cleveland, Birmingham	2.60	2.60	2.60	2.60
Tin plate, 100 lb. base box: Pittsburgh and Gary	$5.00	$5.00	$5.00	$5.00

Pig Iron

Per Gross Ton:				
No. 2 fdy., Philadelphia	$24.84	$24.84	$24.84	$22.84
No. 2, Valley furnace	23.00	23.00	23.00	21.00
No. 2, Southern Cin'ti	23.06	23.06	23.06	21.06
No. 2, Birmingham	19.38	19.38	19.38	17.38
No. 2, foundry, Chicago†	23.00	23.00	23.00	21.00
Basic, del'd eastern Pa.	24.34	24.34	24.34	22.34
Basic, Valley furnace	22.50	22.50	22.50	20.50
Malleable, Chicago†	23.00	23.00	23.00	21.00
Malleable, Valley	23.00	23.00	23.00	21.00
L. S. charcoal, Chicago	30.34	30.34	30.34	28.34
Ferromanganese, seab'd carlots	100.00	100.00	100.00	80.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.

Scrap

Per Gross Ton:				
Heavy melting steel, P'gh	*$16.75*	$17.00	$17.25	$16.00
Heavy melting steel, Phila.	17.25	17.25	17.25	15.25
Heavy melting steel, Ch'go.	*15.625*	15.875	15.625	14.25
Carwheels, Chicago	*17.00*	17.25	17.25	13.00
Carwheels, Philadelphia	20.25	20.25	20.25	16.75
No. 1 cast, Pittsburgh	18.25	18.25	18.25	15.50
No. 1 cast, Philadelphia	20.25	20.25	20.25	16.75
No. 1 cast, Ch'go (net ton)	*13.50*	13.75	14.25	12.75

Coke, Connellsville

Per Net Ton at Oven:				
Furnace coke, prompt	$4.00	$4.00	$4.00	$3.75
Foundry coke, prompt	5.25	5.25	5.25	4.75

Non-Ferrous Metals

Cents per Lb. to Large Buyers:				
Copper, Electrolytic, Conn.	11.50	11.50	11.50	11.25
Copper, Lake, New York	11.50	11.50	11.50	11.375
Tin (Straits), New York	*46.50*	48.75	46.00	46.15
Zinc, East St. Louis	5.75	5.75	5.50	4.50
Zinc, New York	6.14	6.14	5.89	4.89
Lead, St. Louis	5.25	5.25	5.00	4.70
Lead, New York	5.10	5.10	4.85	4.85
Antimony (Asiatic), N. Y.	16.50	16.50	16.50	14.00

On export business there are frequent variations from the above prices. Also in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables.

The Iron Age Composite Prices

	Finished Steel	Pig Iron	Steel Scrap
Mar. 19, 1940	2.261c. a Lb.	$22.61 a Gross Ton	$16.54 a Gross Ton
One week ago	2.261	22.61	16.71
One month ago	2.261	22.61	17.33
One year ago	2.286	20.61	15.08
	Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strip. These products represent 85 per cent of the United States output.	Based on average for basic iron at Valley furnace and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.	Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	Finished Steel HIGH	Finished Steel LOW	Pig Iron HIGH	Pig Iron LOW	Steel Scrap HIGH	Steel Scrap LOW
1940					$17.67, Jan. 2	$16.54, Mar. 19
1939	2.286c., Jan. 3	2.236c., May 16	$22.61, Sept. 19	$20.61, Sept. 12	22.50, Oct. 3	14.08, May 16
1938	2.512c., May 17	2.211c., Oct. 18	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.512c., Mar. 9	2.249c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.92, Nov. 10
1936	2.249c., Dec. 28	2.016c., Mar. 10	19.73, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.062c., Oct. 1	2.056c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.118c., Apr. 24	1.945c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.953c., Oct. 3	1.792c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.915c., Sept. 6	1.870c., Mar. 15	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.981c., Jan. 13	1.883c., Dec. 29	15.90, Jan. 6	14.79, Dec 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.192c., Jan. 7	1.962c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.236c., May 28	2.192c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3

. . . THIS WEEK'S MARKET NEWS . . .

OPERATIONS

. . . Production declines half point to 62½ per cent

INGOT production slipped another point to 62½ per cent this week after the decline, starting in January, had been checked momentarily. Mill schedules in the two leading steel-producing areas were improved over last week but this gain was offset by losses elsewhere, notably in the WHEELING-WEIRTON district, where output dropped 14 points to 68 per cent of capacity.

Operations in the PITTSBURGH area gained two points to 58 per cent and CHICAGO rose a half point to 59½ per cent. CLEVELAND declined two points to 70 per cent, the SOUTHERN district sagged two points to 78 per cent and the ST. LOUIS rate dropped 3 points to 58½ per cent. Operations at PHILADELPHIA and other centers were little changed.

NEW BUSINESS

. . . Bookings slightly heavier in most steel-making areas

INCOMING specifications at PITTSBURGH in the past week were in better volume than the week before, both as to tonnage and actual number of orders placed. The increase in the number of orders booked reflects, to some extent, a broadening in miscellaneous demand, even though the tonnages involved are not large. Leading products continue to be billets, sheet bars, skelp, and hot rolled bars, no small tonnage of which reflects export buying. Although aggregate business in some cases is running almost up to or ahead of the corresponding period a month ago, this better showing is due almost entirely to support from foreign purchasing. Export placements so far this month are ahead of the corresponding number of days last month and there is a tendency for inquiries to turn into firm contracts at a faster rate than was the case a few months ago. In addition to South American countries and Britain, Scandinavian and Far Eastern nations have become more active.

Total bookings last week in the CHICAGO district were slightly higher than the previous week. Generally speaking, new business is still coming in at the rate of 40 per cent of capacity or less. It was predicted here several weeks ago that a substantial upturn would probably not be seen until April or perhaps as late as May. Sentiment among Chicago sellers now supports this opinion whereas previously some thought an important increase would have been seen by now.

Railroad authorities still feel that the carriers, if they show even moderately good earnings, will order from 50,000 to 70,000 cars this year. Other steel officials feel that if this program is carried out, steel business will be helped. If the railroads fail, however, to order this needed rolling stock, it is believed that general business will suffer more than the loss of this tonnage alone would indicate.

Construction activity around CHICAGO is increasing seasonally but residential building is outstripping industrial erection. Export inquiries are lighter.

Incoming business continues spotty at CLEVELAND, but at mid-month was slightly ahead of the first two weeks of February. Agricultural machinery makers, refrigerator manufacturers and automobile parts producers have been the most active buyers during the past week. New tonnage also includes a fair amount of line pipe and rails. However, in all this buying there is no indication of a trend, and it is presumed several weeks more at least will be required before the outlook can be clarified.

Buying for domestic account in the PHILADELPHIA area continues very slow and involves only small lots for immediate shipment. Deliveries on all products except alloy bars, are normal. Italy has placed 22,000 tons of plates, bars and shapes with an Eastern mill. This tonnage, which includes 16,000 tons of hull plates, will be used for the construction of several ships. Between 400 and 500 tons of boiler plate for this project are still pending. Outside of this order, there was little export activity in the past week. Export prices continue soft. Two Eastern Pennsylvania plate producers were low on two lots of steel for the Navy under its new plan of buying six months' requirements rather than buying for specific boats. The tonnage involved in these two lots is estimated at from 8000 to 10,000 tons and includes both high tensile and carbon steel hull plates. Low bids on this business were below published levels but heavy extras apply on practically all the material. Several fair-sized lots of oil country goods have been placed lately with PHILADELPHIA sellers, but this material is mostly for stocking purposes and not for specific drilling or line projects.

Except for quiet covering of pig iron needs for second quarter there was no new business development in SOUTHERN OHIO the past week. Flat steel is still disappointing and billet demand is without change. A moderate increase is shown in warehouse items but no trend is indicated.

BUFFALO reports the market dull for all lines. Orders have fallen away to a small volume and no upswing soon is foreseen. Consumers' stocks are not unduly heavy, however, and sentiment is good. Heavier grades are expected to become more active shortly.

PIG IRON

. . . Exports gain; domestic market continues quiet

FRESH demand and shipments have been at substantially unchanged levels for the past few weeks in the PITTSBURGH district. CLEVELAND reports melters' operations remain at about the same level with foundries catering to the machine tool industry showing the greatest improvement compared with one year ago.

Some sellers in the NEW YORK area report shipments so far in March exceed those of the corresponding periods in January or February and find some improvement in export orders, particularly for southeastern Europe. An order for 4000 tons of iron has been placed for shipment to Bulgaria.

Quiet covering for second quarter needs expanded pig iron order books in SOUTHERN OHIO the past week. Coincident with the new business, melters increased specifications to replenish inventories. The melt is reported to be up fractionally as a result of a slightly better automotive melt. Machine tool foundries continue to pace the market. BUFFALO district pro-

ducers of pig iron report volume so far in March well above that of a year ago. With some exceptions it is also above that of February.

Shipments of pig iron to melters in the ST. LOUIS district are improving, and it is estimated that the first three weeks will show an increase of approximately 10 per cent over February. Melters' piles have become smaller, accounting for the heavier movement. Few sales are being made.

BOSTON reports little buying. Foundries are being assured of no change in the prices during the second quarter and are confining purchases to actual needs, these being very largely for mixture purposes. The inclination of foundries seems to be to reduce inventories. Foundries making castings for textile machinery, special machinery, machine tools and for airplane construction are going very strong. Small and jobbing foundries not engaged in making such castings are back on a five-day-a-week schedule or less. The aggregate New England melt, however, is holding near 70 per cent of capacity.

The market in PHILADELPHIA shows little activity as consumers continue to operate off old contracts. Melting operations are holding up fairly well and present indications are that March shipments will at least equal those of February. Export business still is hampered by lack of cargo space.

PRICES

. . . Differential reestablished between billet, rail steel merchant bars

MAJOR steel prices continue firm this week with the usual weaknesses existent in the concrete reinforcing bar market. A minor price situation has arisen whereby makers of rail steel merchant bars have reestablished a differential between this product and new billet steel merchant bars. Rail steel merchant bars are now quoted $2 below new billet bars, whereas last fall, before they were placed on a parity, the differential was $3. Rail steel reinforcing bar published quotations have also been reduced, thereby reestablishing the $3 differential between the published price of new billet reinforcing bars. In the case of reinforcing bar prices, however, the published quotations are purely nominal.

SHEETS AND STRIP

. . . Number of orders suggests broadening of demand

ALTHOUGH total sheet business booked at PITTSBURGH so far this month is not much if any greater than during the corresponding period in February, some makers have noticed an increase in the number of actual orders placed. This condition suggests a broadening of basic demand and may portend greater activity soon on the part of miscellaneous users of sheets. With automobile companies going through the final stretch on current models, it is expected that sheet orders from that source will be more in the nature of fill-in and balancing-out specifications between now and the end of the present model production. Although tonnages involved were quite small, producers have booked orders from barrel, furniture, electrical and home appliance manufacturers.

CLEVELAND reports gains in releases and new business from diversified consumers last week. The automotive industry remains the leader with accounts serving the agricultural trade also active and export bookings good. Requirements of refrigerator and stove makers have been noteworthy also. The amount of frozen tonnage on mill books is being reduced slowly.

Slight increases in the tonnage coming from the general manufacturing trade and from automobile sources have been noticed in the past week by CHICAGO sellers. This improvement may mean that the bottom has been reached and that the trend from now on will be upward. It is felt, however, that bookings will not rise materially for at least another month. By then, inventories should be well down.

Sheet sales in the NEW YORK district are spotty. Aside from the placement of the regular April and May requirements, respectively, of two leading builders of refrigerators and stoves, both substantial, there has been little in the way of new ordering. Export buying of sheets is fairly active, though the percentage of orders obtained to those bid upon is still discouragingly small. Prices continue on the downgrade. Galvanized sheets are now bringing about 3.60c., f.a.s., compared with an official price of 4.15c. not many months back.

A small improvement in galvanized sheet demand in SOUTHERN OHIO the past week stimulated optimism but was offset by easing in the general sheet demand. Consequently, business averages are unchanged from the 50 per cent of last week. Automotive ordering is without zest, but general miscellaneous business is steady.

Warehouses in the Southern territory served by ST. LOUIS are beginning to buy galvanized sheets in carload lots, and it is expected that the movement throughout the territory will show a substantial improvement, now that weather permits farmers to make repairs.

SEMI-FINISHED STEEL

. . . Specifications increase as domestic demand improves

TOTAL specifications covering billets, sheet bars, and skelp are somewhat ahead of a month ago and show definite improvement from a week ago. While no small portion of this increase is due to further expansion in export requirements, domestic demand has stepped up within the past few weeks. Some of the countries taking sheet bars and other semi-finished steel include Scandinavian and Far East nations. Orders from South American countries are still numerous.

New business of CLEVELAND producers showed a gain of approximately 10 per cent at mid-month contrasted with February.

. . . PLATES . . .

. . . Producers look to car makers to revive market

THE plate market at PITTSBURGH is relatively dull following placement of substantial export business a few weeks ago. Producers are still pinning their hopes on the reawakening in railroad car business. New tonnage received by CLEVELAND producers at mid-month was slightly behind the comparable February period but the difference was very small.

New plate business continues at a low level in the NEW YORK area. Export plates are being quoted from 2.00c. to 2.20c. f.a.s. New York. Except for the large tonnage of ship plates for Italy reported last week, little business is being done.

Domestic plate sales in EASTERN PENNSYLVANIA are extremely dull and it is doubtful if the week-to-week volume would support an open hearth schedule of 40 per cent of capacity. The difference between that figure and actual operations is made by Government and export business, and to a smaller degree by stocking. Two district producers were low on two lots

of hull steel for the Navy Department. The Italian business, placed last week, included 16,000 tons of hull plates. Between 400 and 500 tons of boiler plates for this project is still pending. Bids on the Navy business, which is estimated to amount to between 8000 and 10,000 tons of high tensile and carbon steel hull material, were below domestic published prices, but the extensive extras applying on most of this material, made it highly desirable business. The Navy letting was the first under a new procedure being tried out by the Government. Under the new plan, contracts will be placed for estimated six-months' requirements, rather than for specific projects. Navy contracts outstanding will be cleaned up before releases are given under the new plan.

New inquiries which may involve more than 5000 tons were listed on the PACIFIC COAST. The Los Angeles Department of Water and Power conduit in Mono County, Cal., will take 1600 tons, and the Aluminum Co. of America at Vancouver, Wash., will require about 1000 tons. Substantial additional tonnage will be required for four 22-ft. diameter penstocks for Parker Dam power plant on which bids will be taken April 15.

Hopes are still held at CHICAGO for an active year in railroad equipment buying. As high as 70,000 cars may be ordered, according to some authorities. Should this figure be attained, plate mills will find themselves much better occupied than at present. Deliveries at CHICAGO are being quoted from a week to 10 days.

WIRE PRODUCTS

. . . Spring buying reported beginning in some areas

SEASONAL influences are slowly coming to the fore, according to CLEVELAND producers and sellers of merchant products. Farm buying is more active than at the start of this month. Meanwhile, manufacturers' wire and rods for both domestic and export markets continue unchanged from the level of activity reported last week.

Total wire sales at PITTSBURGH are decidedly not up to the volume booked during the corresponding period last month. The failure of demand to improve is noticeable in wire rods, manufacturers' wire and, to some extent, in merchant wire products. Concerning the latter, inclement weather is being blamed for the retardation in the usual spring pickup.

Nails and fencing are being ordered by warehouses in the Southern states served by ST. LOUIS, with spring buying just beginning, in carload lots. Further substantial improvement is expected as the weather moderates.

Though Chicago has enjoyed several spring-like days recently, the season is not sufficiently advanced to bring out the vanguard of the usual spring demand from the country district. Occasional snows through the Middle West and continued sub-freezing temperatures are prolonging this inactivity. Orders for industrial wire products are about on a par with a week ago. Several CHICAGO consumers who cater to the automobile industry are looking ahead to 1941 models but no production orders for these cars have yet been received.

RAILROAD BUYING

. . . Lackawanna orders 11 diesel-electric switchers

RAILROAD buying continues at a very slow pace, with motive power purchases making up the bulk of the activity from a dollar value basis. Delaware, Lackawanna & Western has ordered 11 diesel-electric switchers from Electro-Motive Corp. and three from American Locomotive Co., and Tennessee Central is taking bids on several locomotive tenders. Illinois Central has placed an order for 62 covered-top hopper cars with General American Transportation Corp., Nashville, Chattanooga & St. Louis is taking bids on 200 freight cars and Northwestern Refrigerator Line is seeking bids on 200 refrigerator cars. Jones & Laughlin Steel Corp. recently allocated 250 mine cars and 200 mine car bodies among several manufacturers.

Boston Elevated Railway has purchased 26 A.C.F. motor coaches powered with Hall-Scott horizontal engines.

BOLTS, NUTS AND RIVETS

. . . Prices are reaffirmed for second quarter delivery

LAMSON & SESSIONS CO., one of the leading bolt and nut producers, has reaffirmed the current prices for second quarter deliveries. This action was decided upon despite the increases on manufacturers' wire brought about by revised extras. A leading CLEVELAND cap screw manufacturer has reaffirmed present prices for second quarter.

New business of the industry in general so far this month shows a gratifying increase over the corresponding February period and further gains are expected.

STRUCTURAL STEEL

. . . Awards advance to 13,750 tons from 9900 tons last week

THE volume of structural steel lettings is slightly higher at 13,750 tons against 9900 tons last week. The largest awards are 3300 tons for a Boston Navy Yard building; 2580 tons for the Fort Hamilton High School, Brooklyn; 1500 tons for Navy buildings on Midway Island in the Pacific Ocean, and 1200 tons for a warehouse for Sears, Roebuck & Co., at Chicago.

New structural steel projects declined to 8700 tons from 11,600 tons in the previous week. The only sizable jobs reported are for Government hangars and include 3500 tons at Gravelly Point, Va., and 1200 tons at Kodiak, Alaska.

Demand for structural steel at PITTSBURGH continues to fluctuate considerably. Although the pick up in privately financed projects has been good news to many fabricators, the overall volume of steel required continues somewhat below a satisfactory level.

Hughes-Foulkrod Co., PHILADELPHIA, has been awarded a contract to erect shop No. 16 at the South Boston Navy dock, involving at least 2500 tons of steel.

REINFORCING BARS

. . . Awards advance to 14,250 tons from 9450 tons last week

REINFORCING steel awards advanced to 14,250 tons from 9450 tons last week and include 3750 tons for the Supulveda Dam at Los Angeles, 2500 tons for a reservoir at Toledo, Ohio, and 1050 tons for the Grand Coulee Dam, Wash. Bethlehem Steel Co. will supply the bars for the Toledo reservoir and the Grand Coulee Dam. The Sepulveda Dam award went to the Blue Diamond Corp., Los Angeles.

New reinforcing steel projects are lower at 11,100 tons against 14,700 tons a week ago. The largest new jobs reported are 4750 tons at Los Angeles for Los Angeles River improvements and 2650 tons at Coram, Cal., for the Shasta Dam power plant.

Concrete bar price situation is substantially the same as a week ago, with prices ranging about $5 below published quotations on new billet steel bars, and $2 below the newly published price on rail steel reinforcing bars. Lower quotations than these levels have also been obtained on some projects. Makers of rail steel reinforcing bars have reestablished the differential between that grade and new billet reinforcing bars which existed prior to last fall, when the two grades were placed on a parity. Rail steel reinforcing bar published quotations are now $3 below the so-called published price on new billet reinforcing bars or 2.00c. a lb. f.o.b. Pittsburgh and other equivalent basing points.

TUBULAR GOODS

. . . Sales of oil country material account for week's decline

AGGREGATE tubular sales at PITTSBURGH in the past week did not quite come up to the level of the week before, losses having been registered specifically in oil country goods sales. Standard pipe demand has been about unchanged, despite low warehouse stocks at many points. Interest has been revived in the Kansas-Mesaba gas line, although nothing definite has been forthcoming as yet. Recently revised figures on requirements indicate 151,000 tons of pipe, 100,000 tons of which involve 16⅜ in., the balance of the tonnage involving from 12¾ in. down to 2-in. pipe. Whether this large pipe line project which is to run from the Texas gas fields to the Mesaba ore regions materializes, depends considerably on a set of factors, not the least prominent of which is, of course, financial.

There have been several fair-sized purchases of oil country material made recently in the PHILADELPHIA market. These purchases, the first in many months, were essentially for stocking purposes and not for specific projects. Drilling operations, hampered by the extreme weather, are rather slow.

MERCHANT BARS

. . . Demand from farm equipment makers increases specifications

SPECIFICATIONS at CLEVELAND are roughly 5 per cent ahead of last month up to the midway point. Most of the buying in the past week has come from the implement industry for harvesting machinery. A little automotive tonnage is coming out regularly. Rail steel bars, shapes and bands, formerly 2.15c., are now quoted at 2.05c., reestablishing a differential between billet steel, merchant bars and rail steel. Axle steel bars and bands are now 2.10c.

Consumer inventories in the CHICAGO district are generally quite normal according to a steel company survey recently. In a few isolated instances, stocks are unreasonably bloated but by and large the situation is sound. Incoming business continues little changed from previous weeks. Deliveries are virtually prompt as backlogs have almost entirely disappeared.

SHIPBUILDING

Bethlehem Steel Co., Sparrows Point, Md., was the apparent low bidder on the proposed construction of six 13½-knot tankers when the Maritime Commission opened bids on Monday. The Sun Shipbuilding & Dry Dock Co., Chester, Pa., was the apparent low bidder on 16½-knot tankers.

The six vessels will require an estimated 30,840 tons of steel and will be the first of a new series of national defense tankers to be constructed for private operators with the Government paying for certain defense features. For the 13½-knot tankers, bids were $2,195,000, $2,303,000 and $2,470,000 respectively for each of six ships. For the 16½-knot tankers, bids were $2,710,000, $2,602,000, and $2,779,000 respectively for each of six ships.

TIN PLATE

. . . Production holds but new orders continue light

TIN plate operations this week are unchanged at 56 per cent. The volume of fresh orders is substantially unchanged from a week ago. Export business continues relatively dull.

IRON ORE

. . . February consumption off 1,000,000 tons from January

Blast furnace consumption of Lake Superior iron ore fell off by approximately one million gross tons in February from January level, according to the latest report of the Lake Superior Iron Ore Association, Cleveland. February consumption was 4,241,839 gross tons against 5,289,308 gross tons in January and 2,852,540 gross tons in February, 1939.

Cumulative consumption to March 1 this year was 9,531,147 gross tons against 5,779,246 tons in the corresponding part of 1939. Ore on hand at furnaces and on Lake Erie docks March 1 totaled 25,966,874 gross tons compared with 30,189,247 tons one month earlier and 28,840,053 tons on the same date one year ago.

There were 122 furnaces in blast depending principally on Lake Superior iron ore on Feb. 29 against 142 a month earlier and 93 one year ago.

Weekly Bookings of Construction Steel

	Week-Ended				Year to Date	
	Mar. 19, 1940	Mar. 12, 1940	Feb. 20, 1940	Mar. 21, 1939	1940	1939
Fabricated structural steel awards.....	13,750	9,900	21,700	16,310	197,060	210,385
Fabricated plate awards	1,905	3,610	0	6,100	34,675	40,030
Steel sheet piling awards	970	1,045	2,135	1,125	8,390	10,565
Reinforcing bar awards	14,250	9,450	6,200	9,800	97,020	112,745
Total Letting of Construction Steel...	30,875	24,005	30,835	33,335	337,145	373,725

FABRICATED STEEL

. . . Lettings higher at 13,750 tons against 9900 tons last week . . . New projects decline to 8700 tons from 11,600 tons in the previous week . . . Plate awards total 1905 tons.

AWARDS

NORTH ATLANTIC STATES

3300 Tons, Boston, Navy Yard building No. 16-DD, to American Bridge Co., Pittsburgh.

2580 Tons, Brooklyn, Fort Hamilton High School, to American Bridge Co., Pittsburgh.

970 Tons, New York, buildings at 331 West 57th Street and 334 West 58th Street, to Dreier Structural Steel Co., New York.

300 Tons, Highland Falls, N. Y., repairs to bridges No. 54 and 56 for New York Central Railroad Co., to American Bridge Co., Pittsburgh.

255 Tons, Old Forge, Pa., State highway bridge, route 35055, to American Bridge Co., Pittsburgh.

150 Tons, Brooklyn, garage for Treasury Department, to Bethlehem Fabricators, Inc., Bethlehem, Pa.

135 Tons, Burlington, N. J., power house conveyor, to Lehigh Structural Steel Co., Allentown, Pa.

130 Tons, Carneys Point, N. J., building for E. I. du Pont de Nemours & Co., to Belmont Iron Works, Philadelphia.

120 Tons, Massena, N. Y., dust handling building, for Aluminum Co. of America, to Lackawanna Steel Construction Co., Buffalo.

120 Tons, New Haven, Conn., Coca-Cola plant, to an unnamed fabricator.

100 Tons, Bedford County, Pa., highway bridges, to Bethlehem Steel Co., Bethlehem, Pa.

THE SOUTH

200 Tons, Gravel Switch, Ky., segmental valves, etc., Kentucky Dam, for TVA, to Worden-Allen Co., Milwaukee.

CENTRAL STATES

1200 Tons, Chicago, warehouse for Sears, Roebuck & Co., to American Bridge Co., Pittsburgh.

640 Tons, Neenah, Wis., factory building for Kimberly-Clark Corp., to Wisconsin Bridge & Iron Co., Milwaukee.

200 Tons, Detroit, garage for Coca-Cola Bottling Co., to Whitehead & Kales Co., Detroit.

145 Tons, Muskingum County, Ohio, highway bridge, to Fort Pitt Bridge Works Co., Pittsburgh.

WESTERN STATES

1500 Tons, Midway Island, Pacific Ocean, Navy buildings, to Columbia Steel Co., San Francisco, through Hawaiian Dredging Co., Ltd., Raymond Concrete Pile Co., and Turner Construction Co., Alameda, Cal., contractors.

975 Tons, Scotia, Cal., Eel River bridge, to Judson-Pacific Co., San Francisco, through A. Soda & Son, Oakland, Cal., contractors.

700 Tons, Sitka, Alaska, Navy buildings, to Columbia Steel Co., San Francisco, through Siems-Drake-Puget Sound, Seattle, contractor.

PENDING STRUCTURAL PROJECTS

NORTH ATLANTIC STATES

400 Tons, Hartford, Conn., County Mutual Life Insurance Co. building; Robert Glenn, Inc., 101 Park Avenue, New York, architect.

265 Tons, Binghamton, N. Y., store building for Montgomery Ward & Co.

200 Tons, Brooklyn, South Brooklyn Savings Bank building.

140 Tons, Naugatuck, Conn., boiler house for Naugatuck Chemical Co.

140 Tons, Schenevus, N. Y., school building for Central School District No. 1.

120 Tons, Taunton, Mass., Nurses' Home and hospital building for Morton Hospital.

120 Tons, Brooklyn, crane runway for Schiavone & Bonomo Corp.

120 Tons, Westmoreland, N. Y., school building.

110 Tons, Larchmont, N. Y., school building for St. Augustine's Church.

110 Tons, Syracuse, N. Y., building for Continental Can Co.

SOUTH AND SOUTHWEST

3500 Tons, Gravelly Point, Va., Government airport hangars and buildings.

610 Tons, State of Oklahoma, highway bridges; Pushamata County, 135 tons; Latimer and Letford Counties, 125 tons, and Cotton County, 350 tons.

168 Tons, Pulaski County, Ark., highway bridge, Ottinger Bros., Hinton, Okla., low bidders on general contract.

CENTRAL STATES

500 Tons, Mansfield, Ohio, State grade crossing elimination.

325 Tons, Genoa, Wis., tri-state power cooperative; L. G. Arnold, Inc., Eau Claire, Wis., contractor.

300 Tons, Painesville, Ohio, Industrial Rayon Co. factory addition; Geo. A. Rutherford Co., Cleveland, general contractor.

250 Tons, Elyria, Ohio, Elyria Foundry Division of Industrial Brownhoist Corp.

100 Tons, Cleveland, fabricated coke bins for Republic Steel Corp.

Unstated tonnage, Cleveland, bridge at Jennings Road over Big Creek.

WESTERN STATES

1200 Tons, Kodiak, Alaska, hangars for Naval station.

450 Tons, Estes Park, Colo., Continental Divide tunnel supports (Specification 902); bids April 8.

340 Tons, Los Angeles, Los Angeles River improvement, section 6; bids April 9. (Project previously reported.)

FABRICATED PLATES

AWARDS

675 Tons, New York, prison building cell plates for city, to Bethlehem Steel Co., Bethlehem, Pa.

490 Tons, Washington, hangar doors for Naval air stations, to an unnamed fabricator.

450 Tons, Reno, Nev., 24-in. pipe for Sierra Pacific Power Co., to Western Pipe & Steel Co., San Francisco.

182 Tons, Stockton, Cal., oil tanks at Rough and Ready Island, to Western Pipe & Steel Co., San Francisco.

105 Tons, Fort City, Pa., floor in Lehr Building for Pittsburgh Plate Glass Co., to Pittsburgh Bridge & Iron Co., Pittsburgh.

PENDING PROJECTS

1600 Tons, Mono County, Cal., Leevining Creek conduit for Los Angeles Department of Water and Power (Specifications 3374); bids April 2.

1000 Tons, Vancouver, Wash., pot shells for Aluminum Co. of America.

580 Tons, Wiota, Mont., tunnel liners (Invitation 425-40-3, Lot 1); bids in.

HAWAII

440 Tons, Kahului, T. H., 500,000-gal. water tank.

SHEET PILING

AWARDS

800 Tons, Cleveland, Cuyahoga River improvement, contract No. 25, to Carnegie-Illinois Steel Corp., Pittsburgh, through Merritt-Chapman & Scott, Meriden, Conn.

167 Tons, Saginaw, Mich., city letting, to Inland Steel Co., Chicago.

PENDING PROJECTS

1600 Tons, Mare Island, Cal., dry dock; Ben C. Gerwick, Inc., and Clyde W. Wood, San Francisco, contractors.

100 Tons, Cleveland, blast furnace foundations for Republic Steel Corp.

. . . PIPE LINES . . .

Kansas Pipe Line & Gas Co., Manhattan, Kan., has asked bids for sections of proposed new welded steel pipe line, 10-in. and smaller, from Texas Panhandle gas field to points in Minnesota, including iron ore districts in northern part of State, about 1000 miles in all, for natural gas transmission. Branch lines will be built along route for gas supply to cities and towns, ultimate project to include gas service to over 100 communities. Natural gas, also, will be furnished for iron ore-mining operations at terminus noted. Entire line will be electrically welded and will have rated capacity of 120,000,000 cu. ft. per day. Cost over $30,000,000 with booster stations, control and meter houses, and other operating facilities.

Southern Natural Gas Co., Watts Building, Birmingham, is arranging fund of about $3,000,000 for expansion and improvements in properties, including main welded steel pipe lines and laterals, gathering lines, booster stations and service facilities. Work will include new 8-in. welded steel pipe line from connection with present main line to Chattanooga, Tenn., about 44 miles, where service will be furnished Chattanooga Gas Co. for local distribution. Latter company has scheduled a series of rate hearings before Tennessee Railroad and Public Commission early in April, and on approval of proposed gas rates in city work will proceed at once on pipe line construction. Southern company is arranging early financing to provide gross appropriation noted.

Bureau of Reclamation, Denver, asks bids until April 15 for four 22 ft. diam. welded plate-steel penstocks, from 100 to about 250 ft. long, for penstock tunnels at Parker hydroelectric power plant, Parker Dam project, California-Arizona, about 15 miles from Earp, Cal. (Specifications 898).

Toledo Edison Co., Toledo, Ohio, has let contract to H. L. Gentry Engineering Co., 921 East Michigan Street, Jackson, Mich., for welded steel pipe line from Defiance, Ohio, to connection with main pipe line system of Panhandle Eastern Pipe Line Co., Kansas City, Mo., extending from Texas to Detroit, for natural gas transmission to Defiance. New line will be about six miles long. Local distribution will be carried out by Defiance Division of first noted company.

Nacogdoches, Tex., has postponed special election from April 2 to April 16 to vote bonds for $150,000 for proposed municipal natural gas distribution system. H. G. Stallings is city engineer.

United States Engineer Office, Little Rock, Ark., asks bids until March 25 for 1000 ft. of 3½-in. black steel pipe, including 12 couplings (Circular 93).

Gulf Plains Corp., Jones Building, Corpus Christi, Tex., has awarded contract to Stearns-Rogers Corp., 1720 California Street, Denver, for high-pressure pipe line gathering system in gas field near Agua Dulce and Stratton fields, Nueces County, Tex., about 22 miles in all, for natural gas supply for new recycling plant in course of construction at Agua Dulce.

Purchasing and Contracting Officer, Office of Quartermaster, Lowry Field, Denver, asks bids until March 28 for steel pipe, small sizes (Circular 117-16).

House Committee Votes To Increase NLRB to 5

WASHINGTON—The House Labor Committee vote of 14 to 3 on Tuesday to amend the Wagner Labor Act by adding two members of the National Labor Relations Board is held to be an effort to defeat the proposal of the Smith committee to abolish the board and reconstitute it as a three-member organization. Chairman Mary T. Norton, of the House Labor Committee, said that the committee by a close vote rejected the Smith amendment to abolish the present board.

. . . NON-FERROUS . . .

. . . Resale copper softer, but producers' quotations hold unchanged . . . Lead demand slow . . . Spelter buying very poor, but shipments hold up well . . . Tin unsettled.

NEW YORK, March 19—The uncertainties generated by the trend of the political situation abroad, coinciding with efforts of domestic consumers to work off heavy purchases of two months ago, produced in the past week one of the dullest trading periods experienced in some time. Resale copper was notably weaker all week and by yesterday there were moderate offerings in the outside market at as low as 11.25c. per lb., delivered Connecticut Valley. This weakness was immediately followed by a reduction of ¼c. per lb. in scrap buying prices of custom smelters to 9.75c. for No. 1 wire. This level is approximately equal to 11.25c. per lb. for refined metal. The custom price for refined metal is not known as their prices are no longer available for publication, but the producers continued to stick to the 11.50c. level. The export market was dull all week and prices drifted nominally lower. Nearby copper for export was estimated this morning to be worth about 11.40c. per lb., f.a.s. Domestic sales for the week averaged about 1000 tons a day.

NON-FERROUS PRICES

Cents per lb. for early delivery

	Mar. 13	Mar. 14	Mar. 15	Mar. 16	Mar. 18	Mar. 19
Copper, Electrolytic[1]	11.50	11.50	11.50	11.50	11.50	11.50
Copper, Lake	11.50	11.50	11.50	11.50	11.50	11.50
Tin, Straits, New York	48.00	47.375	47.125	....	46.50	46.50
Zinc, East St. Louis[2]	5.75	5.75	5.75	5.75	5.75	5.75
Lead, St. Louis[3]	5.10	5.10	5.10	5.10	5.10	5.10

[1] Delivered Conn. Valley. Deduct ¼c. for New York delivery. [2] Add 0.39c. for New York delivery. [3] Add 0.15c. for New York delivery.

Warehouse Prices

Cents per lb., Delivered

	New York	Cleveland
Tin, Straits, pig	47.75c.	52.00c.
Copper, Lake	13.25c.	12.625c.
Copper, electro	12.75c.	12.625c.
Copper, castings	12.375c.	12.375c.
*Copper sheets, hot-rolled	20.12c.	20.12c.
*Yellow brass sheets	18.31c.	18.31c.
*Seamless brass tubes	21.06c.	21.06c.
*Seamless copper tubes	20.62c.	20.62c.
*Yellow brass rods	14.26c.	14.26c.
Zinc slabs	7.10c.	7.75c.
Zinc sheets, No. 9 casks	12.00c.	13.35c.
Lead, American pig	6.25c.	5.75c.
Lead, bar	8.20c.	8.50c.
Lead, sheets, cut	8.50c.	8.50c.
Antimony, Asiatic	16.00c.	17.00c.
Alum., virgin, 99 per cent plus	21.50c.	22.50c.
Alum., No. 1 remelt., 98 to 99 per cent	19.00c.	19.50c.
Solder, ½ and ½	29.75c.	30.00c.
Babbitt metal, anti-friction grade	27.75c.	20.25c.

*These prices, which are also for delivery from Chicago warehouses, are quoted with the following percentages allowed off for extras: on copper sheets, 33⅓; on brass sheets and rods, 40; on brass tubes, 33⅓, and copper tubes, 40.

Old Metals

Cents per lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators. Selling prices are those charged to consumers after the metal has been prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	9.50c.	10.125c.
Copper, hvy. and wire	8.50c.	8.875c.
Copper, light and bottoms	7.50c.	8.00c.
Brass, heavy	5.00c.	5.50c.
Brass, light	4.125c.	4.875c.
Heavy machine composition	8.00c.	8.625c.
No. 1 yel. brass turnings	4.75c.	5.75c.
No. 1 red brass or compos. turnings	7.50c.	8.00c.
Lead, heavy	4.00c.	7.375c.
Cast aluminum	8.00c.	9.00c.
Sheet aluminum	14.00c.	15.00c.
Zinc	2.75c.	4.00c.

Miscellaneous Non-Ferrous Prices

ALUMINUM, delivered: virgin, 99 per cent plus, 20c.-21c. a lb.; No. 12 remelt No. 2 standard, 19c.-19.50c. a lb. NICKEL, electrolytic, 35c.-36c. a lb. base refinery, lots of 2 tons or more. ANTIMONY, prompt: Asiatic, 16.50c. a lb., New York; American, 13c. a lb., f.o.b. smelter. QUICKSILVER, $183 per flask of 76 lb. BRASS INGOTS, commercial 85-5-5-5, 12c. a lb.

Zinc

Spelter demand showed further slackening in the week past, but shipments held up well. Prime Western sales in the past week were 402 tons, while shipments were 3993 tons. Deliveries in the preceding week amounted to 4150 tons. The same factors affecting the copper market were in evidence in the spelter market during the week, but the fact that most consumers have coverage only through this month provided a measure of support lacking in copper. Quotations remain unchanged at 6.14c. per lb., New York.

Lead

Buying in the past week slowed up considerably, but no great importance was attached to this as most consumers are well bought on March needs and perhaps 65 per cent covered on April. Shipments into consumption are in good volume, especially to battery makers. The usual seasonal demand for lead by the construction industries is being delayed by the weather. Sellers, meanwhile, are marking time and quotations appear firm at 5.25c. per lb., New York.

Tin

Uncertainty over the foreign outlook and offerings of supplies not covered by the British decree requiring that either dollars or official sterling rates be used in settling for purchases of British Empire products, caused a general downward revision of prices here in the past week. Trading was very slow all week, with importers still reluctant to sell, pending digestion of the new decree. Today's quotation on Straits tin, New York, is 46.50c. per lb. as compared with 48.75c. a week ago. Prices in London also moved down in the week, with cash standards being quoted today at £247 15 s.

Wysor, of Republic Steel, Addresses Cleveland Group

CLEVELAND—The war in Europe did not cause our most serious domestic problems, and it will not solve them, warned R. J. Wysor, president, Republic Steel Corp., in an address here March 19 before the Cleveland Junior Association of Commerce.

"The prosperity and expansion of free enterprise in future years in this mation depend upon the peoples verdict for or against stricter government regimentation," he said.

"Meanwhile, even under present conditions, opportunities are not lacking in industry. Executives are on the alert for younger men with the capacity to take hold of the helm. Executives who are going to be running industry in the years ahead will have to be better men than the oldsters who have been running it in the past."

IRON AND STEEL SCRAP

. . . Drop of 17c. in the composite price to $16.54 reflects general dullness in the market.

MARCH 19—The weakness presaged by softness in railroad lists at Pittsburgh last week has been carried into other grades and this week regular No. 1 heavy melting steel is quoted 25c. lower on the average, based on small sales. At Chicago also, the market is softer and the whole list has been lowered 25c. In eastern Pennsylvania, the market is very quiet, but prices on the prime grades are unchanged. As a result of these price movements, the composite price is 17c. lower this week, at $16.54, the first move from the $16.71 level since Feb. 20.

Elsewhere, dullness rules and prices are nominally unchanged. No. 1 steel is stronger at St. Louis because of short coverages, but the absence of mill buying has weakened the price of No. 2, and mixed trends are noted in other grades. At several points blast furnace material is softer. Only at Detroit is any bullish tendency observed and buying prices are higher there.

Pittsburgh

The market continues exceedingly dull. A small amount of No. 1 heavy melting steel has been sold into consumption recently at $16.50, while other points have paid as much as $17 a ton. On the basis of actual transactions, No. 1 heavy melting is quotable this week at $16.50 to $17, down 25c. from a week ago. No. 2 heavy melting is also softer. Railroad scrap rails are being sold to Ohio foundries at higher than the quotations carried for this district, there being practically no demand for this product at the present time in the Pittsburgh district.

Chicago

On the basis of a sale early this week at $15.75, heavy melting steel is now quoted at $15.50 to $15.75. Brokers are offering $15.50 to dealers, 25c. a ton less than a week ago and though little has been obtained at that price, dealers do not expect to be paid $15.75 much longer. At the latter figure, steel will move freely today but few brokers are willing to pay it. Sentimentally the entire list is weaker, though little action has been seen during the past week. Material is moving into dealers' yards slowly but the advent of spring weather will doubtless greatly increase this tonnage.

Philadelphia

The market here continues very quiet, with quotations on the prime grades unchanged from a week ago. A moderate sale of stove plate to a mill in the Harrisburg area at $15.50 has raised quotations on this item an average of 25c. Machine shop turnings are strong at $10.50. The boat expected at Port Richmond a week ago has been delayed and will probably not arrive until later this week. This boat, which is scheduled to discharge the scrap in Spain, will take about 4300 tons, the bulk of which is already on the dock. Last prices paid for this material were $16.25 for No. 1 steel and $15.25 for No. 2.

Youngstown

Steel producers are taking shipments at about the same level of recent weeks, and dealers are still waiting for the market to be tested by fresh mill purchases, which is not a likely prospect at this writing because the necessity is not urgent. Nominal published prices are unchanged.

Cleveland

Activity is negligible here except for foundry grades which always are moving in small amounts. Machine shop turnings and similar light materials are a drag on the market and are reported going to the Pittsburgh district in small tonnages. Open-hearth grades remain at a standstill. There is not even much interest in the fact that navigation will open soon, facilitating the movement from upper Lake ports.

Buffalo

Little or no activity marked the scrap market this week following sizable purchases last week. Some cast scrap is being sold to Canada. Although values are no weaker at the present time, spring thaws and reduced mill operations are expected by some dealers to have a depressing effect.

St. Louis

The scrap iron market at St. Louis is quiet. Dealers continue to buy to cover a heavy short interest, and the movement from the country continues to improve, but dealers express disappointment at the offerings. Mills are out of the market, a situation which has caused a decline of 50c. in No. 2 heavy melting steel. Railroad lists: Southern, 6200 tons; Chicago, Rock Island & Pacific, 3200 tons, and St. Louis-San Francisco, 700 tons.

Cincinnati

Dealer's bids are unchanged, although not sufficiently attractive to bring out more material. Mills refuse to purchase in the absence of better steel business. Yard supplies are fairly good.

Birmingham

Minor changes in four quoted items in the scrap set-up were made during the past week. There has been no change in Nos. 1 and 2 heavy melting steel. Dealers as well as buyers are finding it difficult to size up the scrap market in this territory. Movements are without impressiveness and there seems to be no likelihood of immediate changes. The reduced operations of Republic and Tennessee have some effect on the market and there is the additional fact that pipe companies are operating only two and three days per week.

Boston

The Weirton mill came into the market last week and lifted its price on steel turnings 50c. a ton; then withdrew, after which the market settled about 50c. a ton under its old price basis. One broker is paying $8.75 a ton on cars for bundled skeleton against an old order, but on new business $8 to $8.25 is the current price basis. Blast furnace material has dropped about 50c. a ton. In contrast, breakable cast is fetching slightly better prices. The export market continues active with shipments from ports and buying of scrap by exporters increasing. For export, heavy melting steel is definitely 50c. a ton higher.

New York

The vessel situation is a little easier this week, with four boats loading in New York harbor. There is little buying activity in connection with these shipments, however, since most of the material was already on barges. In fact, prices are on the soft side and some brokers have lowered their bids 50c. on Nos. 1 and 2 steel. The present quotation on No. 2 steel for export partly represents a correction of previous quotations. No. 1 steel is still relatively scarce here and there is a wide disparity in the price paid for No. 2.

Toronto

Further improvement was reported in iron and steel scrap markets for the week, although prices remained unchanged. Steel mills are placing contracts for heavy melting steel for second quarter and also are taking spot delivery on all new offerings by dealers. Steel scrap shipments to the Hamilton mills are reported in excess of 1000 tons weekly. Shipments to the Niagara section also are gaining in volume. Foundries and other users of iron scrap are showing more interest in the market. New buying is becoming more general.

Detroit

Speculative buying—with large quantities of material being laid down on the docks in anticipation of spring transportation on the lakes—has been an important factor in pushing Detroit scrap prices upward even in the face of instructions holding up shipments of scrap to the plant of the principal consumer in the area. In addition, foundry activity in connection with automotive tool and die programs is steadily increasing the price of foundry scrap, with the flow materially reduced by an indicated possible shortage. Bundles sold by a large independent body manufacturer are reported to have brought prices as much as 50c. higher than the present quotation but the figure cannot be verified.

Iron and Steel Scrap Prices

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$16.50 to $17.00
Railroad heavy melting	17.75 to 18.25
No. 2 heavy meltning..	15.00 to 15.50
Railroad scrap rails...	17.75 to 18.25
Rails 3 ft. and under...	20.50 to 21.00
Comp. sheet steel	16.50 to 17.00
Hand bundled sheets..	15.50 to 16.00
Heavy steel axle turn.	14.50 to 15.00
Machine shop turnings	10.50 to 11.00
Short. shov. turnings..	12.00 to 12.50
Mixed bor. & turn....	8.75 to 9.25
Cast iron borings	8.75 to 9.25
Cast iron carwheels ..	18.50 to 19.00
Heavy breakable cast.	15.00 to 15.50
No. 1 cupola cast	18.00 to 18.50
RR. knuckles & coup..	20.50 to 21.00
Rail coil springs.....	20.50 to 21.00
Rail leaf springs.....	20.50 to 21.00
Rolled steel wheels ...	20.50 to 21.00
Low phos. billet crops.	21.00 to 21.50
Low phos. punchings..	20.50 to 21.00
Low phos. heavy plate.	19.50 to 20.00
Railroad malleable	21.00 to 21.50

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$17.00 to $17.50
No. 2 hvy. mltng. steel.	16.00 to 16.50
Hydraulic bund., new.	17.00 to 17.50
Hydraulic bund., old..	14.00 to 14.50
Steel rails for rolling..	20.50 to 21.00
Cast iron carwheels...	20.00 to 20.50
Hvy. breakable cast...	.... 18.50
No. 1 cupola cast	20.00 to 20.50
Mixed yard (f'd'y) cast	.... 16.50
Stove plate (steel wks.)	15.00 to 15.50
Railroad malleable ...	21.00 to 22.00
Machine shop turn....	..... 10.50
No. 1 blast furnace..	..... 10.00
Cast borings	10.50 to 11.00
Heavy axle turnings...	15.00 to 15.50
No. 1 low phos. hvy...	21.00 to 21.50
Couplers & knuckles ..	21.00 to 21.50
Rolled steel wheels ...	21.00 to 21.50
Steel axles	21.50 to 22.00
Shafting	22.00 to 22.50
Spec. iron & steel pipe	16.00 to 16.50
Cast borings (chem.)..	14.00 to 14.50

CHICAGO

Delivered to Chicago district consumers:

	Per Gross Ton
Hvy. mltng. steel	$15.50 to $15.75
Auto. hvy. mltng. steel alloy free	14.50 to 14.75
No. 2 auto steel	12.50 to 13.00
Shoveling steel	15.50 to 15.75
Factory bundles	15.00 to 15.25
Dealers' bundles	13.50 to 13.75
No. 1 busheling	14.50 to 14.75
No. 2 busheling, old...	5.50 to 6.00
Rolled carwheels	17.75 to 18.25
Railroad tires, cut	18.00 to 18.50
Railroad leaf springs..	17.50 to 18.00
Steel coup. & knuckles.	17.50 to 18.00
Axle turnings	14.25 to 14.75
Coil springs	18.50 to 19.00
Axle turn. (elec.)	16.00 to 16.50
Low phos. punchings..	17.75 to 18.25
Low phos. plates 12 in. and under	17.25 to 17.75
Cast iron borings	8.75 to 9.25
Short shov. turn.	9.25 to 9.75
Machine shop turn....	8.50 to 9.00
Rerolling rails	18.00 to 18.50
Steel rails under 3 ft..	17.25 to 17.75
Steel rails under 2 ft..	18.25 to 18.75
Angle bars, steel	17.50 to 18.00
Cast iron carwheels ...	16.75 to 17.25
Railroad malleable	18.00 to 18.50
Agric. malleable	14.00 to 14.50
	Per Net Ton
Iron car axles	$21.25 to $21.75
Steel car axles	20.00 to 20.50
Locomotive tires	14.00 to 14.50
Pipes and flues	10.50 to 11.00
No. 1 machinery cast..	13.25 to 13.75
Clean auto. cast	13.50 to 14.00
No. 1 railroad cast....	13.00 to 13.50
No. 1 agric. cast.....	11.75 to 12.25
Stove plate	8.50 to 9.00
Grate bars	9.25 to 9.75
Brake shoes	10.25 to 10.75

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$17.00 to $17.50
No. 2 hvy. mltng. steel.	16.00 to 16.50
Low phos. plate	20.00 to 20.50
No. 1 busheling	16.25 to 16.75
Hydraulic bundles	16.50 to 17.00
Machine shop turn....	11.00 to 11.50

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$16.00 to $16.50
No. 2 hvy. mltng. steel.	15.00 to 15.50
Comp. sheet steel	15.50 to 16.00
Light bund. stampings	13.00 to 13.50
Drop forge flashings...	14.00 to 14.50
Machine shop turn.....	8.50 to 9.00
Short shov. turn.	9.50 to 10.00
No. 1 busheling	14.75 to 15.25
Steel axle turnings....	14.50 to 15.00
Low phos. billet and bloom crops	20.50 to 21.00
Cast iron borings	9.50 to 10.00
Mixed bor. & turn....	9.50 to 10.00
No. 2 busheling	9.50 to 10.00
No. 1 cupola cast.	17.00 to 17.50
Railroad grate bars...	13.50 to 14.00
Stove plate	13.50 to 14.00
Rails under 3 ft.	20.50 to 21.00
Rails for rolling	20.00 to 20.50
Railroad malleable	19.50 to 20.00

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$16.00 to $16.50
No. 2 hvy. mltng. steel.	14.50 to 15.00
Scrap rails	17.00 to 17.50
New hvy. b'ndled sheets	14.50 to 15.00
Old hydraul. bundles..	12.50 to 13.00
Drop forge flashings...	14.00 to 14.50
No. 1 busheling	14.00 to 14.50
Machine shop turn....	9.50 to 10.00
Shov. turnings	12.50 to 13.00
Mixed bor. & turn.....	10.00 to 10.50
Cast iron borings	10.00 to 10.50
Knuckles & couplers..	20.00 to 21.00
Coil & leaf springs....	20.00 to 21.00
Rolled steel wheels ...	20.00 to 21.00
No. 1 machinery cast..	17.50 to 18.00
No. 1 cupola cast.....	16.50 to 17.00
Stove plate	14.50 to 15.00
Steel rails under 3 ft...	21.50 to 22.00
Cast iron carwheels...	17.50 to 18.00
Railroad malleable ...	19.00 to 19.50

ST. LOUIS

Dealers' buying prices per gross ton delivered to consumer:

Selected hvy. melting	$14.50 to $15.00
No. 1 hvy. melting....	14.25 to 14.75
No. 2 hvy. melting....	13.00 to 13.50
No. 1 locomotive tires.	15.25 to 15.75
Misc. stand. sec. rails.	15.25 to 15.75
Railroad springs	16.50 to 17.00
Bundled sheets	9.00 to 9.50
No. 1 busheling	13.00 to 13.50
Cast bor. & turn.....	5.75 to 6.25
Machine shop turn....	6.50 to 7.00
Heavy turnings	10.00 to 10.50
Rails for rolling	17.00 to 17.50
Steel car axles	18.00 to 18.50
No. 1 RR wrought....	10.50 to 11.00
No. 2 RR wrought....	13.25 to 13.75
Steel rails under 3 ft..	18.00 to 18.50
Steel angle bars	15.00 to 15.50
Cast iron carwheels..	15.50 to 16.00
No. 1 machinery cast..	16.50 to 17.00
Railroad malleable ...	16.25 to 16.75
Breakable cast	13.75 to 14.25
Stove plate	11.25 to 11.75
Grate bars	10.00 to 10.50
Brake shoes	11.00 to 11.50

CINCINNATI

Dealers' buying prices per gross ton at yards:

No. 1 hvy. mltng. steel	$12.50 to $13.00
No. 2 hvy. mltng. steel.	10.50 to 11.00
Scrap rails for mltng..	17.00 to 17.50
Loose sheet clippings.	8.00 to 8.50
Hydrau. b'ndled sheets	12.00 to 12.50
Cast iron borings	3.75 to 4.25
Machine shop turn....	5.00 to 5.25
No. 1 busheling	9.00 to 9.50
No. 2 busheling	3.00 to 3.25
Rails for rolling	18.50 to 19.00
No. 1 locomotive tires.	14.00 to 14.50
Short rails	19.00 to 19.50
Cast iron carwheels...	14.50 to 15.00
No. 1 machinery cast..	16.00 to 16.50
No. 1 railroad cast.....	14.00 to 14.50
Burnt cast	7.75 to 8.25
Stove plate	7.75 to 8.25
Agricul. malleable	12.50 to 13.00
Railroad malleable	15.50 to 16.00
Mixed hvy. cast.	13.50 to 14.00

BIRMINGHAM

Per gross ton delivered to consumer:

No. 1 hvy. melting steel	$15.00
No. 2 hvy. melting steel	14.00
No. 1 busheling	14.00
Scrap steel rails	15.00
Steel rails under 3 ft...	16.00
Rails for rolling	$16.50
Long turnings	5.00
Cast iron borings	7.50
Stove plate	10.00
Steel axles	18.00
No. 1 RR wrought.....	14.00
No. 1 cast	16.00
No. 2 cast	12.50
Cast iron carwheels	13.00
Steel car wheels	16.00

DETROIT

Dealers' buying prices per gross ton:

No. 1 hvy. mltng. industrial steel	$12.50 to $13.00
No. 2 hvy. mltng. steel.	11.50 to 12.00
Borings and turnings.	6.75 to 7.25
Long turnings	7.25 to 7.75
Short shov. turnings..	8.25 to 8.75
No. 1 machinery cast..	14.50 to 15.00
Automotive cast	15.50 to 16.00
Hvy. breakable cast...	11.50 to 12.00
Stove plate	8.75 to 9.25
Hydraul. comp. sheets.	13.75 to 14.25
New factory bushel....	12.00 to 12.50
Sheet clippings	8.50 to 9.50
Flashings	12.00 to 12.50
Low phos. plate scrap.	13.75 to 14.25

NEW YORK

Dealers' buying prices per gross ton on cars:

No. 1 hvy. mltng. steel	$13.00 to $13.50
No. 2 hvy. mltng. steel.	11.50 to 12.00
Hvy. breakable cast...	.... 14.00
No. 1 machinery cast.	16.00 to 16.50
No. 2 cast	12.50 to 13.00
Stove plate	10.50 to 11.00
Steel car axles	19.00 to 20.00
Shafting	19.00 to 20.00
No. 1 RR. wrought....	14.00 to 15.00
No. 1 wrought long....	12.50 to 13.00
Spec. iron & steel pipe	13.50 to 14.00
Rails for rolling	15.50 to 16.00
Clean steel turnings*..	6.00 to 6.25
Cast borings*	6.00 to 6.25
No. 1 blast furnace....	6.00 to 6.25
Cast borings (chem.)..	Nominal
Unprepared yard scrap	7.00 to 7.50
Light iron	5.00 to 5.50

Per gross ton, delivered local foundries

No. 1 machin. cast.....	$17.00 to $18.50
No. 2 cast	16.50 to 17.00

* $1.50 less for truck loads.

BOSTON

Dealers' buying prices per gross ton

Breakable cast	$12.75 to $13.00
Machine shop turn.....	4.65 to 4.85
Mixed bor. & turn.....	4.15 to 4.25
Bun. skeleton long....	8.00 to 8.25
Shafting	17.00 to 17.25
Stove plate	9.75 to 10.00
Cast bor. chemical	8.00 to 8.50

Per gross ton delivered consumers' yards:

Textile cast	$17.50 to $19.00
No. 1 machine cast....	17.50 to 19.00

Per gross ton delivered dealers' yards:

No. 1 hvy. mltng. steel.	$13.25
No. 2 steel	12.25

PACIFIC COAST

Dealers' buying prices per gross ton on cars:

No. 1 hvy. mltng. steel.	$10.50 to $12.50
No. 2 hvy. mltng. steel.	9.50 to 11.50

CANADA

Dealers' buying prices at these yards, per gross ton:

	Toronto	Montreal
Low phos. steel.....	$11.50	$11.00
No. 1 hvy. mltng. steel.	11.00	10.50
No. 2 hvy. mltng. steel.	9.75	9.25
Mixed dealers steel...	8.75	8.25
Drop forge flashings...	9.75	9.25
New loose clippings...	8.75	8.25
Busheling	6.00	5.50
Scrap pipe	7.75	7.25
Steel turnings	7.00	6.50
Cast borings	6.50	6.00
Machinery cast	17.00 to	16.50
Dealers' cast	16.00 to	15.50
Stove plate	12.00 to	11.50

EXPORT

Dealers' buying prices per gross ton:

New York, truck lots, delivered, barges

No. 1 hvy. mltng. steel.	$13.50 to $14.00
No. 2 hvy. mltng. steel.	11.50 to 12.50
No. 2 cast	12.00 to 12.50
Stove plate	10.00 to 10.50

Boston on cars at Army Base or Mystic Wharf

No. 1 hvy. mltng. steel.	$15.50
No. 2 hvy. mltng. steel.	14.50
Rail (scrap)	$15.50 to 15.75
Stove plate	8.25 to 8.50

Philadelphia, delivered alongside boats, Port Richmond.

No. 1 hvy. mltng. steel.	$16.25 to $16.50
No. 2 hvy. mltng. steel.	15.25

PRICES ON FINISHED AND SEMI-FINISHED IRON AND STEEL

Steel prices on these pages are base prices only and f.o.b. mill unless otherwise indicated. On some products either quantity deductions or quantity extras apply. In many cases gage, width, cutting, physical, chemical extras, etc., apply to the base price. Actual realized prices to the mill, therefore, are effected by extras, deductions, and in most cases the amount of freight which must be absorbed in order to meet competition

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (Rerolling only). Prices delivered Detroit are $2 higher. F.o.b. Duluth, billets only, $2 higher.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods
(No. 5 to 9/32 in.)

	Per Lb.
Pittsburgh, Chicago or Cleveland	2.00c.
Worcester, Mass.	2.10c.
Birmingham	2.00c.
San Francisco	2.45c.
Galveston	2.25c.

9/32 in. to 47/64 in. $3 a net ton higher. Quantity extras apply.

SOFT STEEL BARS

	Base per Lb.
Pittsburgh, Chicago, Gary, Cleveland, Buffalo and Birmingham	2.15c.
Detroit, delivered	2.25c.
Duluth	2.25c.
Philadelphia, delivered	2.47c.
New York	2.49c.
On cars dock Gulf ports	2.50c.
On cars dock Pacific ports	2.75c.

RAIL STEEL BARS

(For merchant trade)

Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham	2.05c.
On cars dock Tex. Gulf ports	2.40c.
On cars dock Pacific ports	2.65c.

BILLET STEEL REINFORCING BARS

(Straight lengths as quoted by distributers)

Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Cleveland, Youngstown or Sparrows Pt.	1.90c.
Detroit, delivered	2.00c.
On cars dock Tex. Gulf ports	2.25c.
On cars dock Pacific ports	2.25c.

RAIL STEEL REINFORCING BARS

(Straight lengths as quoted by distributers)

Pittsburgh, Chicago, Gary, Buffalo, Cleveland, Youngstown or Birmingham	1.75c. to 1.90c.
Detroit, delivered	1.85c. to 2.00c.
On cars dock Tex. Gulf ports	2.25c.
On cars dock Pacific ports	2.25c.

IRON BARS

Chicago	2.25c.
Pittsburgh (refined)	3.75c.

COLD FINISHED BARS AND SHAFTING*

Pittsburgh, Buffalo, Cleveland, Chicago, and Gary	2.65c.
Detroit	2.70c.

* In quantities of 20,000 to 39,999 lb.

PLATES

	Base per Lb.
Pittsburgh, Chicago, Gary, Birmingham, Sparrows Point, Cleveland, Youngstown, Coatesville, Claymont, Del.	2.10c.
Philadelphia, del'd	2.15c.
New York, del'd	2.29c.
On cars dock Gulf ports	2.45c.
On cars dock Pacific ports	2.60c.
Wrought iron plates, P'tg	3.80c.

FLOOR PLATES

Pittsburgh or Chicago	3.35c.
New York, del'd	3.71c.
On cars dock Gulf ports	3.70c.
On cars dock Pacific ports	3.95c.

STRUCTURAL SHAPES

	Base per Lb.
Pittsburgh, Chicago, Gary, Buffalo, Bethlehem or Birmingham	2.10c.
Philadelphia, del'd	2.215c.
New York, del'd	2.27c.
On cars dock Gulf ports	2.45c.
On cars dock Pacific ports	2.70c.

STEEL SHEET PILING

	Base per Lb.
Pittsburgh, Chicago or Buffalo	2.40c.
On cars dock Gulf ports	2.85c.
On cars dock Pacific ports	2.90c.

RAILS AND TRACK SUPPLIES

F.o.b. Mill

Standard rails, heavier than 60 lb., per gross ton	$40.00
Angle bars, per 100 lb	2.70

F.o.b. Basing Points

Light rails (from billets) per gross ton	$40.00
Light rails (from rail steel) per gross ton	39.00

	Base per Lb.
Cut spikes	3.00c.
Screw spikes	4.55c.
Tie plates, steel	2.15c.
Tie plates, Pacific Coast ports	2.25c.
Track bolts, to steam railroads	4.15c.
Track bolts to jobbers, all sizes (per 100 counts)	65-5

Basing points on light rails are Pittsburgh, Chicago and Birmingham; on spikes and tie plates, Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnesaqua, Colo., Birmingham and Pacific Coast ports; on tie plates alone, Steelton, Pa., Buffalo; on spikes alone, Youngstown, Lebanon Pa., Richmond, Va.

SHEETS

Hot Rolled

	Base per Lb.
Pittsburgh, Gary, Birmingham, Buffalo, Sparrows Point, Cleveland, Youngstown, Middletown or Chicago	2.10c.
Detroit, delivered	2.20c.
Philadelphia, delivered	2.27c.
Granite City	2.20c.
On cars dock Pacific ports	2.60c.
Wrought iron, Pittsburgh	4.10c.

Cold Rolled*

Pittsburgh, Gary, Buffalo, Youngstown, Cleveland, Middletown or Chicago	3.05c.
Detroit, delivered	3.15c.
Granite City	3.15c.
Philadelphia, delivered	3.37c.
On cars dock Pacific ports	3.65c.

* Mill run sheets are 10c. per 100 lb. less than base; and primes only, 25c. above base.

Galvanized Sheets, 24 Gage

Pittsburgh, Chicago, Gary, Sparrows Point, Buffalo, Middletown, Youngstown or Birmingham	3.50c.
Philadelphia, delv'd	3.67c.
Granite City	3.60c.
On cars dock Pacific ports	4.00c.
Wrought iron, Pittsburgh	6.10c.

Electrical Sheets
(F.o.b. Pittsburgh)

	Base per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

Silicon Strip in coils—Sheet price plus silicon sheet extra width extra plus 25c per 100 lb. for coils. Pacific ports add 70c. a 100 lb.

Long Ternes

No. 24 unassorted 8-lb. coating f.o.b. Pittsburgh or Gary	3.80c.
F.o.b. cars dock Pacific ports	4.50c.

Vitreous Enameling Stock, 20 Gage*

Pittsburgh, Chicago, Gary, Youngstown, Middletown or Cleveland	3.35c.
Detroit, delv'd	3.45c.
Granite City	3.45c.
On cars dock Pacific ports	3.95c.

TIN MILL PRODUCTS

Tin Plate

	Per Base Box
Standard cokes, Pittsburgh, Chicago and Gary (100 lb.)	$5.00
Standard cokes, Granite City (100 lb.)	5.10

Special Coated Manufacturing Ternes

	Per Base Box
Granite City	$4.40
Pittsburgh or Gary	4.30

Roofing Terne Plate
(F.o.b. Pittsburgh per Package, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00
25-lb. coating I.C.	8.00	16.00
30-lb. coating I.C.	8.63	17.25
40-lb. coating I.C.	9.75	19.50

Black Plate, 29 gage and lighter*

Pittsburgh, Chicago and Gary	3.05c.
Granite City	3.15c.
On cars dock Pacific ports, boxed	4.00c.

* Black plate base price applies to 29 gage within certain width and length limitations.

HOT ROLLED STRIP

(Widths up to 12 in.)

	Base per Lb.
Pittsburgh, Chicago, Gary, Cleveland, Middletown, Youngstown or Birmingham	2.10c.
Detroit, delivered	2.20c.
On cars dock Pacific ports	2.70c.

Cooperage Stock

Pittsburgh & Chicago	2.20c.

COLD ROLLED STRIP*

	Base per Lb.
Pittsburgh, Youngstown or Cleveland	2.80c.
Chicago	2.90c.
Detroit, delivered	2.90c.
Worcester	3.00c.

* Carbon 0.25 and less.

Commodity Cold Rolled Strip

Pittsburgh, Youngstown, or Cleveland	2.95c.
Detroit, delivered	3.05c.
Worcester	3.35c.

COLD ROLLED SPRING STEEL

		Pittsburgh and Cleveland	Worcester
Carbon	0.26-0.50%	2.80c.	3.00c.
Carbon	0.51-0.75	4.30c.	4.50c.
Carbon	0.76-1.00	6.15c.	6.35c.
Carbon	1.01-1.25	8.35c.	8.55c.

WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh, Chicago, Cleveland and Birmingham)

To Manufacturing Trade

	Per Lb.
Bright wire	2.60c.
Galvanized wire, base	2.60c.
Spring wire	3.20c.

To the Trade

	Base per Keg
Standard wire nails	$2.55
Coated nails	2.55
Cut nails, carloads	3.55

	Base per 100 Lb.
Annealed fence wire	$3.05
Woven wire fence, 15½ gage and heavier base col.	67
Fence posts (carloads), base col.	69
Single loop bale ties, base col.	56
Galvanized barbed wire on 80-rod spools (carloads) base col.	70
Twisted barbless wire, base col.	70

Note: Birmingham base same on above items, except spring wire.

STEEL AND WROUGHT IRON PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

F.o.b. Pittsburgh only on wrought iron pipe.

Butt Weld

Steel In.	Black	Galv.	*Wrought Iron* In.	Black	Galv.
⅛	.56	36	¼ & ⅜	+9	+30
¼ to ⅜	.59	43½	½	.24	6½
½	.63½	54	¾	.30	13
¾	.66½	58½	1 & 1¼	.34	19
1 to 3	.68½	60½	1½	.38	21½
			2	.37½	21

Lap Weld

2	.61	52½	2	.30½	15
2½ & 3	.64	55½	2½ to 3½	.34½	17½
3½ to 6.66		57½	4	.33½	21
7 & 8.65		55½	4½ to 8.32½		20
9 & 10.64½		55	9 to 12	.28½	15
11 & 12.63½		54			

Butt weld, extra strong, plain ends

⅛	.54½	41½	¼ & ⅜	+10	+43
¼ to ⅜	.56½	45½	½	.25	9
½	.61½	53½	¾	.31	15
¾	.65½	57½	1 to 2	.38	22½
1 to 3	.67	60			

Lap weld, extra strong, plain ends

2	.59	51½	2	.33½	18½
2½ & 3	.63	55½	2½ to 4	.39½	25½
3½ to 6.66		59	4½ to 6	.37½	24
7 & 8.65		56	7 & 8	.38½	24½
9 & 10.64		55	9 to 12	.32	20½
11 & 12.63		54			

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher, on all butt weld 8 in. and smaller.

Boiler Tubes

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes. Minimum Wall. (Net base prices per 100 ft. f.o.b. Pittsburgh in carload lots)

	Seamless Cold Drawn	Seamless Hot Rolled	Lap Weld Hot Rolled
1 in. o.d. 13 B.W.G.	$ 9.01	$ 7.82	....
1¼ in. o.d. 13 B.W.G.	10.67	9.26	....
1½ in. o.d. 13 B.W.G.	11.70	10.23	$9.72
1¾ in. o.d. 13 B.W.G.	13.42	11.64	11.06
2 in. o.d. 13 B.W.G.	15.03	13.04	12.38
2¼ in. o.d. 13 B.W.G.	16.76	14.54	13.79
2½ in. o.d. 12 B.W.G.	18.45	16.01	15.16
2½ in. o.d. 12 B.W.G.	20.21	17.54	16.58
2¾ in. o.d. 12 B.W.G.	21.42	18.59	17.54
3 in. o.d. 12 B.W.G.	22.48	19.50	18.35
3½ in. o.d. 11 B.W.G.	28.37	24.62	23.15
4 in. o.d. 10 B.W.G.	35.20	30.54	28.66
4½ in. o.d. 10 B.W.G.	43.04	37.35	35.22
5 in. o.d. 9 B.W.G.	54.01	46.87	44.25
6 in. o.d. 7 B.W.G.	82.93	71.96	68.14

Extras for less carload quantities:

40,000 lb. or ft. over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	30%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%

CAST IRON WATER PIPE

Per Net Ton

*6-in. and larger, del'd Chicago	$54.80
6-in. and larger, del'd New York	52.20
*6-in. and larger, Birmingham	46.00
6-in. and larger, f.o.b. dock, San Francisco or Los Angeles	52.00
F.o.b. dock, Seattle	52.00
4-in. f.o.b. dock, San Francisco or Los Angeles	55.00
F.o.b. dock, Seattle	52.00

Class "A" and gas pipe, $3 extra 4-in. pipe is $3 a ton above 6-in.

Prices for lots of less than 200 tons. For 200 tons and over, 6-in. and larger is $45. Birmingham, and $53.80 delivered Chicago.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland Birmingham or Chicago)

Per Cent Off List

Machine and carriage bolts:	
½ in. and 6 in. and smaller	68½
Larger and longer up to 1 in.	66
1⅛ in. and larger	64
Lag bolts	66
Plow bolts, Nos. 1, 2, 3, and 7	68½
Hot pressed nuts, and c.p.c. and t-nuts, square or hex. blank or tapped:	
½ in. and smaller	67
9/16 in. to 1 in. inclusive	64
1⅛ in. to 1½ in. incl.	62
1⅝ in. and larger	60

On the above items with the exception of plow bolts, there is an additional allowance of 10 per cent for full container quantities.

On all of the above items there is an additional 5 per cent allowance for carload shipments.

	U.S.S.	S.A.E.
Semi-fin. hexagon nuts ½ in. and smaller	67	70
9/16 to 1 in.	64	65
1⅛ in. and larger	62	62

In full container lots, 10 per cent additional discount.

Stove bolts in packages, with nuts loose	72½
Stove bolts in packages, with nuts attached, add 15% extra.	
Stove bolts in bulk	83½

On stove bolts freight is allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

Large Rivets

(½ in. and larger)

Base per 100 Lb.

F.o.b. Pittsburgh, Cleveland Chicago, Birmingham $3.40

Small Rivets

(7/16 in. and smaller)

Per Cent Off List

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham ...65 and 10

Cap and Set Screws

(Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.)

Per Cent Off List

Milled hexagon head, cap screws, 1 in. dia. and smaller	50 and 10
Milled headless set screws, cut thread ¼ in. and larger	64
3/16 in. and smaller	73
Upset hex. head cap screws U.S.S. or S.A.E. thread 1 in. and smaller	70
Upset set screws, cup and oval points	75
Milled studs	52

Alloy Steel

Alloy Steel Blooms, Billets and Slabs

F.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem.
Base price, $56.00 a gross ton.

Alloy Steel Bars

F.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton.

Open-hearth grade, base	2.70c.
Delivered, Detroit	2.80c.

S.A.E. Series Numbers	Alloy Differential per 100 Lb.
200 (½% Nickel)	$0.35
2100 (1½% Nickel)	$0.75
2300 (3½% Nickel)	1.55
2500 (5% Nickel)	2.25
31 Nickel-chromium	0.70
3200 Nickel-chromium	1.85
3300 Nickel-chromium	3.80
3400 Nickel-chromium	3.20
4100 Chromium-molybdenum (0.15 to 0.25 Molybdenum)	0.55
4100 Chromium-molybdenum (0.25 to 0.40 Molybdenum)	0.75
4340 Chr.-Ni.-Mo.	1.65
4345 Chro.-Ni.-Mo.	1.85
4600 Nickel - molybdenum (0.20 to 0.30 Mo. 1.50 to 2.00 Ni.)	1.10
5100 Chrome steel (0.60-0.90 Cr.)	0.35
5100 Chrome steel (0.80-1.10 Cr.)	0.45
6100 Chromium spring steel	0.15
6100 Chromium-vanadium bar	1.20
6100 Chromium-vanadium spring steel	0.85
Chromium-nickel vanadium	1.50
Carbon-vanadium	0.35

These prices are for hot-rolled steel bars. The differential for most grades in electric furnace steel is 50c. higher. Slabs with a section area of 16 in. and 2½ in. thick or over take the billet base.

Alloy Cold-Finished Bars

F.o.b. Pittsburgh, Chicago, Gary, Cleveland or Buffalo, 3.35c. base per lb. Delivered Detroit, 3.45c., carlots

STAINLESS & HEAT RESISTANT ALLOYS

(Base prices, cents per lb. f.o.b. Pittsburgh)

Chrome-Nickel

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25c.	24c.
Plates	29c.	27c.
Structural shapes	25c.	24c.
Sheets	36c.	34c.
Hot-rolled strip	23.50c.	21.50c.
Cold-rolled strip	30c.	28c.
Drawn wire	25c.	24c.

Straight Chrome

	No. 410	No. 430	No. 442	No. 446
Bars	18.50c.	19c.	22.50c.	27.50c.
Plates	21.50c.	22c.	25.50c.	30.50c.
Sheets	26.50c.	29c.	32.50c.	36.50c.
Hot stp.	17c.	17.50c.	24c.	35c.
Cold stp.	22c.	22.50c.	32c.	52c.

TOOL STEEL

High speed	67c.
High-carbon-chrome	43c.
Oil-hardening	24c.
Special	22c.
Extra	18c.
Regular	14c.

Prices for warehouse distribution to all points on or East of Mississippi River are 2c. a lb higher. West of Mississippi quotations are 3c a lb. higher.

British and Continental

BRITISH

Per Gross Ton f.o.b. United Kingdom Ports

Ferromanganese, export	£17 18s.
Tin plate, per base box	32s. to 33s.
Steel bars, open hearth	13£ 9s.
Beams, open hearth	12£ 2s. 6d.
Channels, open hearth	12£ 2s. 6d.
Angles, open hearth	12£ 2s. 6d.
Black sheets, No. 24 gage	17£ max.*; 17£ min.**
Galvanized sheets, No. 24 gage	19£ 10s. max.*; 19£ 10s. min.**

* Empire markets only.
** Other than Empire markets.

CONTINENTAL

Per Gross Ton, Belgian Francs f.o.b. Continental Ports

Bars, merchant	1500
Plates	1750
Joists	1475
Sheets, thin	1900

Above price are minimum base to which 100 francs should be added to cover war risk insurance, freight charges, etc.

RAW MATERIALS PRICES

PIG IRON

No. 2 Foundry

F.o.b. Everett, Mass.	$24.00
F.o.b. Bethlehem, Birdsboro and Swedeland, Pa., and Sparrows Point, Md.	24.00
Delivered Brooklyn	26.50
Delivered Newark or Jersey City	25.53
Delivered Philadelphia	24.84
F.o.b. Neville Island, Erie, Pa., Toledo, Chicago, Granite City, Cleveland and Youngstown	23.00
F.o.b. Buffalo	23.00
F.o.b. Detroit	23.00
Southern, delivered Cincinnati	23.06
Northern, delivered, Cincinnati	23.44
F.o.b. Duluth	23.50
F.o.b. Provo, Utah	21.00
Delivered, San Francisco, Los Angeles or Seattle	26.50
F.o.b. Birmingham*	19.38

* Delivered prices on southern iron for shipment to northern points are 38c. a ton below delivered prices from nearest northern basing point on iron with phosphorus content of 0.70 per cent and over.

Malleable

Base prices on malleable iron are 50c. a ton above No. 2 foundry quotations at Everett, Eastern Pennsylvania furnaces, Erie and Buffalo. Elsewhere they are the same, except at Birmingham and Provo, which are not malleable iron basing points.

Basic

F.o.b. Everett, Mass.	$23.50
F.o.b. Bethlehem, Birdsboro, Swedeland and Steelton, Pa., and Sparrows Point, Md.	23.50
F.o.b. Buffalo	22.00
F.o.b. Neville Island, Erie, Pa., Toledo, Chicago, Granite City, Cleveland and Youngstown	22.50
Delivered Philadelphia	24.34
Delivered Canton, Ohio	23.89
Delivered Mansfield, Ohio	24.44
F.o.b. Birmingham	18.00

Bessemer

F.o.b. Buffalo	$24.00
F.o.b. Everett, Mass.	25.00
F.o.b. Bethlehem, Birdsboro and Swedeland, Pa.	25.00
Delivered Newark or Jersey City	26.53
Erie, Pa., and Duluth	24.00
F.o.b. Neville Island, Toledo, Chicago and Youngstown	23.50
F.o.b. Birmingham	24.00
Delivered Cincinnati	24.11
Delivered Canton, Ohio	24.89
Delivered Mansfield, Ohio	25.44

Low Phosphorus

Basing points; Birdsboro, Pa., Steelton, Pa., and Buffalo	$28.50

Gray Forge

Valley or Pittsburgh furnace	$22.50

Charcoal

Lake Superior furnace	$27.00
Delivered Chicago	30.34

Canadian Pig Iron

Per Gross Ton

Montreal

Foundry iron	$27.50 base
Malleable	28.00 base
Basic	27.50 base

Toronto

Foundry Iron	$25.50 base
Malleable	26.00 base
Basic	25.50 base

On all grades 2.25 per cent silicon and under is base. For each 25 points of silicon over 2.25 per cent an extra of 25c. is charged.

FERROALLOYS

Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans.

Per Gross Ton

Domestic, 80% (carload) $100.00

Spiegeleisen

Per Gross Ton Furnace

Domestic, 19 to 21%	$32.00
Domestic, 26 to 28%	39.50

Electric Ferrosilicon

Per Gross Ton Delivered; Lump Size

50% (carload lots, bulk)	$69.50*
50% (ton lots, packed)	82.00*
75% (carload lots, bulk)	126.00*
75% (ton lots, packed)	142.00*

Bessemer Ferrosilicon

F.o.b. Furnace, Jackson, Ohio

Per Gross Ton

10.00 to 10.50% $32.50

For each additional 0.50% silicon up to 12%, 50c. per ton is added. Above 12% add 75c. a ton.

For each unit of manganese over 2%, $1 per ton additional.

Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Silvery Iron

Per Gross Ton

F.o.b. Jackson, Ohio, 5.00 to 5.50% $27.50

For each additional 0.5% silicon up to 12%, 50c. a ton is added. Above 12% add 75c. a ton.

The lower all-rail delivered price from Jackson or Buffalo is quoted with freight allowed. Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Manganese, each unit over 2%, $1 a ton additional. Phosphorus 0.75% or over, $1 a ton additional.

Ferrochrome

Per Lb. Contained Cr., Delivered Carlots, Lump Size, on Contract

4 to 6% carbon	11.00c.
2% carbon	17.50c.
1% carbon	18.50c.
0.10% carbon	20.50c.
0.06% carbon	21.00c.

Spot prices are ¼c. per lb. of contained chromium higher.

Silico-Manganese

Per Gross Ton, Delivered, Lump Size, Bulk, on Contract

3% carbon	$98.00*
2.50% carbon	103.00*
2% carbon	108.00*
1% carbon	118.00*

Other Ferroalloys

Ferrotungsten, per lb. contained W del., carload	$2.00
Ferrotungsten, 100 lbs. and less	2.25
Ferrovanadium, contract, per lb. contained V., delivered	$2.70 to $2.90†
Ferracolumbium, per lb. contained columbium, f.o.b. Niagara Falls, N. Y., ton lots	$2.25†
Ferrocarbontitanium, 15 to 18% Ti, 7 to 8% C, f.o.b. furnace carload and contract per net ton	$142.50
Ferrocarbontitanium, 17 to 20% Ti, 3 to 5% C, f.o.b. furnace, carload and contract, per net ton	$157.50
Ferrophosphorus, electric, or blast furnace material, in carloads, f.o.b. Anniston, Ala., for 18%, with $3 unitage, freight equalized with Rockdale, Tenn., per gross ton	$58.50
Ferrophosphorus, electrolytic 23-26% in car lots, f.o.b. Monsanto (Siglo), Tenn., 24%, per gross ton, $3 unitage, freight equalized with Nashville	$75.00
Ferromolybdenum, per lb. Mo. f.o.b. furnace	95c.
Calcium molybdate, per lb. Mo. f.o.b. furnace	80c.
Molybdenum oxide briquettes 48-52% Mo. per lb. contained Mo. f.o.b. Langeloth, Pa.	80c.

* Spot prices are $5 per ton higher.
† Spot prices are 10c. per lb. of contained element higher.

*ORES

Lake Superior Ores

Delivered Lower Lake Ports

Per Gross Ton

Old range, bessemer, 51.50%	$5.25
Old range, non-bessemer, 51.50%	5.10
Mesaba, bessemer, 51.50%	5.10
Mesaba, non-bessemer, 51.50%	4.95
High phosphorus, 51.50%	4.85

Foreign Ores*

C.i.f. Philadelphia or Baltimore, Exclusive of Duty

Per Unit

Algerian, low P, Cu free, dry, 55 to 58% Fe	14c.
Swedish, low P, 68% Fe	14c.
Swedish, basic or foundry, 65% Fe	12c
Caucasian, washed, 52% Mn	Nom.
African, Indian, 44 to 48% Mn	46c.
African, Indian, 49 to 51% Mn	49c.
Brazilian, 46 to 48% Mn	47c.
Cuban, del'd, duty free, 51% Mn	62c.

Per Short Ton Unit

Tungsten, Chinese, Wolframite, duty paid, delivered	$23.00 to $23.50
Tungsten, domestic scheelite delivered	23.00 to 23.50
Chrome ore, lump c.i.f. Atlantic Seaboard, per gross ton: South African (low grade)	$19.00
Rhodesian, 45%	22.00
Rhodesian, 48%	26.00 to $27.00
Turkish, 48-49%	29.00 to 30.00
Turkish, 45-46%	Nominal
Turkish, 40-41%	Nominal
Chrome concentrates c.i.f. Atlantic Seaboard, per gross ton: Turkish, 48-49%	Nominal

* All foreign ore prices are nominal.

FLUORSPAR

Per Net Ton

Domestic washed gravel, 85-5, f.o.b. Kentucky and Illinois mines, all rail	$21.00
Domestic, f.o.b. Ohio River landing barges	21.00
No. 2 lump, 85-5, f.o.b. Kentucky and Ill. mines	$20.00 to 22.00
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic ports, duty paid	$25.00 to $25.50
Domestic No. 1 ground bulk, 96 to 98% calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines	$31.00
ditto, in bags, f.o.b., same mines	$32.60

FUEL OIL

Per Gal.

No. 3, f.o.b. Bayonne, N. J.	5.10c.
No. 6, f.o.b. Bayonne, N. J.	3.57c.
No. 5 Bur. Stds., del'd Chicago	3.25c.
No. 6 Bur. Stds., del'd Chicago	2.75c.
No. 3 distillate, del'd Cleve'd.	5.25c.
No. 4 industrial, del'd Cleve'd.	5.00c.
No. 5 industrial, del'd Cleve'd.	4.25c.
No. 6 industrial, del'd Cleve'd.	3.875c.

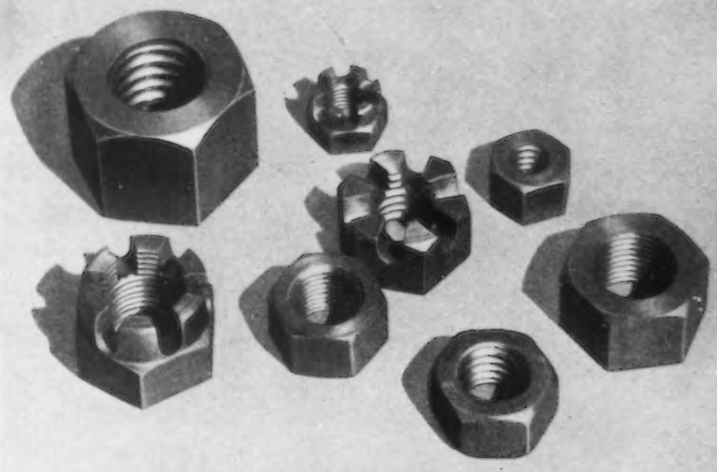
COKE

Per Net Ton

Furnace, f.o.b. Connellsville, Prompt	$4.00 to $4.25
Foundry, f.o.b. Connellsville, Prompt	5.25 to 5.50
Foundry, by-product Chicago ovens	10.50
Foundry, by-product del'd New England	12.50
Foundry, by-product del'd Newark or Jersey City	11.38 to 11.90
Foundry, by-product Philadelphia	11.13
Foundry, by-product delivered Cleveland	11.05
Foundry, by-product delivered Cincinnati	10.50
Foundry, Birmingham	7.50
Foundry, by-product del'd St. Louis industrial district	10.75 to 11.00
Foundry, from Birmingham, f.o.b. cars dock Pacific ports	14.75

YOU CAN GET EVERY *Fastening* YOU NEED HERE

Milled and rough Studs are stocked in popular sizes. When physical requirements and raw materials are specified, made to order in production quantities of carbon or alloy steel, or non-ferrous alloys, from ¼-inch to 1½-inch diameters, any length.



As one of the largest producers of nuts, we supply Semi-Finished, Castle, Slotted, Cold Punched, Hot Pressed, Cold Forged, Stove Bolt and Machine Screw Nuts in any quantity from stocks. We make nuts from non-ferrous alloys to specifications.

Lamson full finished Cap Screws of SAE 1020 steel have approximately 90,000 lbs. per sq. in. *minimum* tensile strength. Our high carbon cap screws of SAE 1035 steel, heat treated, have approximately 150,000 lbs. *minimum* tensile strength.

Lamson Set Screws of a special high carbon heat treated steel compare favorably with much higher priced alloy steel set screws in performance. Cost you no more than common low carbon set screws available heretofore.

● *Regardless of what kind* of fastenings you need, you can get them all from Lamson & Sessions, because we manufacture the most complete line of bolt and nut products in this country. *Regardless of the size* of your order, Lamson & Sessions can fill it completely and quickly, because our five plants maintain their own warehouse stocks as well as supplying a nation-wide network of responsible jobbers. It is an obvious economy of time, effort and expense to order every kind of fastening you need—*in one shipment, at one time, on one invoice, from one manufacturer.* Specify Lamson products for *dependable quality* maintained year after year—and *dependable service* in supplying your needs at all times.

●

THE LAMSON & SESSIONS CO., Cleveland, Ohio

75th ANNIVERSARY 1865-1940

Your Jobber stocks the Lamson line

LAMSON & SESSIONS

BOLTS • • NUTS • • COTTERS • • CAP SCREWS • • SPECIALS

THIS WEEK'S MACHINE ...TOOL ACTIVITIES...

. . . Orders for first half of March are running somewhat ahead of comparable February volume in principal districts reporting . . . Only in the East have dealer sales slackened, but big aircraft program is impending . . . Builders report better sustained domestic volume, with foreign buying steady.

Domestic Demand May Make March Best Month

CINCINNATI — Machinery demand in the southern Ohio area for the first half of March is just a trifle better than the first quarter average. A better sustained domestic business is being recorded, with manufacturers indicating that current business, if continued, will make March the best month of the year so far. Export business is steadily good, with England and France continuing broad purchases, while other foreign buyers are in and out. With virtually all local shops oversold for several months, deliveries are still well extended. Five months is the minimum on many standard type tools, but many are extended to the year's end and even into 1941. Drilling machinery is now active with one manufacturer describing the market as "hectic." Other types are unchanged on current order books.

Production is still a major problem since plants are operating at full capacity on the present supply of skilled labor. Some margin of output, however, is still present if more skilled mechanics were available. Intensive apprentice and shop practice training is being indulged to correct the labor situation, but this, of course, takes time.

March Sales Ahead of February, Thus Far

CHICAGO—New orders received by Chicago machine tool sellers in the first two weeks of March are running slightly ahead of the same period in February. In one office the number of units sold is already more than half the February total with a dozen more orders awaiting formal signing. The volume of inquiries, however, is not as heavy as some sellers would desire. Many of the orders now being closed were quoted on some time ago and this backlog of outstanding quotations is being reduced week by week. The main item of current interest here is the Milwaukee Road list comprising some 25 machine tools. Bids have closed on this list, but it is understood that actual awards probably will not be made until March 25. The Kenosha, Wis., plant of the Nash-Kelvinator Corp. is planning a one-story machine shop addition. The addition to the Milwaukee plant of Kearney & Trecker Corp. is complete except for the installation of certain pieces of machinery, many machines already being in place.

Cleveland Builders Report Favorable Volume

CLEVELAND — After a slow start, March business volume is now termed favorable by most machine tool dealers here. Sales during the past week included several small millers, promised for delivery in around 16 weeks, and vertical boring mills. Aircraft parts plants continue to buy steadily, although awards during the past 10 days have not been sensational. White Motor Co. is reported doing some more tooling.

Demand continues strong for used machinery. British representatives have been in town looking over available stocks.

The delivery of small millers in 16 weeks, mentioned above, cannot be obtained on larger size new machines. Around six months are required on certain sizes of standard production models while No. 4 and No. 5 millers generally require longer than six months.

G. M. Buys Equipment For New Steering Gear

DETROIT—Manufacture of a new type steering gear at Saginaw by General Motors, requiring special machines and tooling, is proposed for 1941 models. Bids are being taken for a new building which will cost close to $100,000, with equipment. A new Pontiac six-cylinder engine has been added to the list of 1941 projects which already include at least two new lines of engines and important modifications of several others.

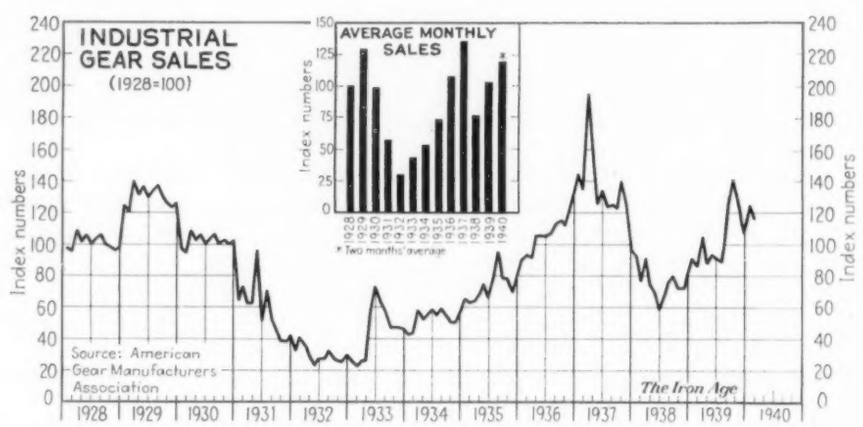
Orders Slump in East, But Inquiries Still Active

NEW YORK—There has been a noticeable drop in orders for machine tools in this district in the past week, but inquiries are still in good volume. What business there is has come from limited sources connected with aircraft and Government contracts in one way or another. On the other hand, a huge aircraft tooling program has been overhanging the market for weeks without action being taken. Everything appears to hinge on negotiations with the Allies on plane and engine orders, reputedly totaling $1,000,000,000. The type of tooling and equipment to be bought will be determined after a decision has been reached on the question of a single standardized design or a policy of continuous design developments.

Dealers having district offices outside New York City report a much more satisfactory volume from those areas than from the immediate vicinity. Part of this business is coming from the automotive industry, but is generally well diversified.

February Gear Sales 35% Ahead of a Year Ago

INDUSTRIAL gear sales in February were down slightly from the January level, but were 35 per cent ahead of February, 1939, the American Gear Manufacturers Association reports. Sales in the first two months of the current year are 35 per cent above the comparable period of 1939. The association's index for February, based on 1928=100, stood at 116, as compared with 123 in January and 86 in February, a year ago. Automobile and marine gears are not included in the index.



Not Our Figures - But Theirs on SPEED TREAT

After heat treating, washer made from SPEED TREAT X 1545 was 20% stronger and 15% harder than washer made from S. A. E. 1045.

SPEED TREAT PERFORMANCE RECORD

NAME OF PART — CYLINDER HEAD STUD WASHER

	PREVIOUS PERFORMANCE	SPEED TREAT PERFORMANCE
MATERIAL	1¼ Rd. SAE 1045	1¼" Rd. S.T. - 1545
MATERIAL COST	$4.40 CWT	$4.65 cwt.
MACHINE COST	$200.00 - 7500 pcs.	$74.00 - 7500 pcs.
HEAT TREAT COST	Same	Same
STRAIGHTENING COST	None	None
GRINDING COST	None	None
MISCELLANEOUS COST	None	None
NET COST PER PART	$.032	$.0157
PARTS PER TON STEEL	15009	15009
NET SAVINGS PER TON OF STEEL USED		$244.64

SUMMARY — MACHINING DATA

SPEED TREAT - 170 S.F.P.M. - 15 Sec. - 240 per hr. - Tool Life - 9 hours

SAE 1045 - 90 S.F.P.M. - 52 Sec. - 70 per hr. - Tool Life - 1½ hour

Note: Burrs had to be removed on 1045 parts.

We Use ONLY Customer's Figures
Case History No. 72

SPEED TREAT X 1545 vs. S. A. E. 1045

Customer's report above shows a **production increase of 343%.** It also shows a tool life 6 times greater. SPEED TREAT X 1545 assures YOU not less than 40% increase in machining and much greater tool life than S. A. E. 1045.

Physical properties: SPEED TREAT X 1545 Cold Drawn . . . 100,000 to 120,000 P. S. I. tensile strength with corresponding ductility.

MONARCH STEEL CO.

HAMMOND · INDIANAPOLIS · CHICAGO

Sole Licensee for Eastern States

THE FITZSIMONS COMPANY
YOUNGSTOWN, OHIO

MONARCH STEEL CO. A-40-3
Indianapolis, Indiana

Gentlemen:

Please send full details concerning Monarch SPEED CASE and SPEED TREAT Steel Bars. Our products are

FIRM_____

ADDRESS_____

CITY AND STATE_____

MANUFACTURERS OF COLD FINISHED CARBON AND ALLOY STEEL BARS!

PLANT EXPANSION AND EQUIPMENT BUYING

NORTH ATLANTIC

Bellanca Aircraft Mfg. Corp. of Mexico, Inc., 122 East Forty-second Street, New York, plans new works in south, with Mobile, Ala., and Biloxi, Miss., under consideration. Cost close to $500,000 with equipment.

General Chemical Co., 40 Rector Street, New York, has let general contract to Geis Construction Co., 146 South Yale Avenue, Columbus, Ohio, for one-story factory branch, storage and distributing plant at Chillicothe, Ohio. Cost close to $40,000 with equipment.

Quartermaster Supply Officer, Army Base, Fifty-eighth Street and First Avenue, Brooklyn, asks bids until March 26 for galvanized wire cloth, 36-in. wide, and copper wire cloth (Circular 626-289).

A. & A. Millwright Machinery Exchange, 1051 Myrtle Avenue, Brooklyn, has leased one-story building at 986-90 Metropolitan Avenue, for new works for production and repair of machinery, truck platforms, etc., and parts manufacture.

Curtis-Wright Corp., 30 Rockefeller Plaza, New York, has let general contract to Independent Erection Co., 153 Seventh Street, Pittsburgh, for one-story addition, 40 x 340 ft., to airplane propeller works, Neville Island, Pittsburgh, acquired a few months ago. Cost close to $75,000 with equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until March 26 for one single-spindle, motor-driven woodboring machine (Schedule 1037) for Brooklyn Navy Yard; forgings for welding end fittings (Schedule 1053) for Brooklyn and Philadelphia yards; three motor-generator sets, three controllers and spare parts (Schedule 1031); until March 29, 200 portable electric drills (Schedule 1073), two hydraulic pump units and spare parts (Schedule 1055), three accumulators (Schedule 1054) for Philadelphia yard; combustible gas indicators (Schedule 1026) for Philadelphia, Eastern and Western yards; aircraft engine overhaul stands (Schedule 1014) for Philadelphia, Quantico and Sewall's Point, Va., and San Diego, Cal., yards.

American Can Co., 230 Park Avenue, New York, plans one-story addition to branch plant at Portland, Me. Cost close to $50,000 with equipment.

Signal Corps Procurement District, Army Base, Fifty-eighth Street and First Avenue, Brooklyn, asks bids until April 3 for coils (Circular 318); until April 5, 32,320 to 101,000 ft. of telephone cable, and 32 to 100 cable reels (Circular 328).

Sherman Signs, Inc., 368 Coit Street, Irvington, N. J., metal signs and displays, has leased one-story building at 9-15 Manufacturers Place, Newark, N. J., and will remove present works to new location and increase capacity.

A. Montone & Co., 144 Mulberry Street, Newark, steel stamps, dies, etc., have leased space in building at 112 Arlington Street, providing double present floor area, for plant.

Commanding Officer, Ordnance Department, Picatinny Arsenal, near Dover, N. J., asks bids until March 25 for one assembling machine (Circular 1229), 60,000 lb. testing machine, hydraulic type, with stress strain recorded (Circular 1246).

R. S. McCracken & Son, 634-36 North Thirteenth Street, Philadelphia, welding equipment, have let general contract to George K. Keebner, Inc., 1231 Vine Street, for one-story addition. Cost close to $40,000 with equipment.

Public Works Officer, Building No. 1, Navy Yard, Philadelphia, asks bids until April 3 for switchgear, power panels, duct lines, transformers, manholes and auxiliary equipment for naval aircraft factory (Specification 9648).

Metropolitan Edison Co., Reading, Pa., will take bids early in summer for addition to local steam-electric power plant, 80 x 225 ft., and 90 ft. high, installation to include 20,000-kw. turbine-generator unit, high-pressure boiler and auxiliary equipment. Cost about $500,000. E. M. Gilbert Engineering Corp., 412 Washington Street, is consulting engineer.

Commanding Officer, Ordnance Department, Frankford Arsenal, Bridesburg, Philadelphia, asks bids until March 26 for aluminum alloy castings (Circular 1374).

BUFFALO DISTRICT

Eastman Kodak Co., Rochester, N. Y., plans one and multi-story addition. Cost close to $100,000 with equipment.

E. I. du Pont de Nemours & Co., Inc., R. & H. Chemicals Division, Niagara Falls, N. Y., plans expansion and modernization in plant, for increased capacity. Cost about $400,000, of which larger part will be expended for equipment. Main offices are in du Pont Building, Wilmington, Del.

Hewitt Rubber Co., 240 Kensington Avenue, Buffalo, mechanical rubber products, has arranged appropriation of about $200,000 for expansion and improvements, including four-story addition, for which contract recently was let to John W. Cowper Co., Sidway Building, and another three-story unit, 60 x 140 ft., for which plans are being completed. New rubber-mixing and other machinery, conveyor system, and other equipment will be installed. H. E. Plummer & Associates, Inc., 775 Main Street, is consulting engineer.

WESTERN PA. DIST.

Allegheny Ludlum Steel Corp., Oliver Building, Pittsburgh, will begin work soon on two additions to branch plant at Dunkirk, N. Y., each one-story, for expansion in wire division and for annealing. Cost over $200,000 with equipment.

Tom Tucker Beverage Co., 500 College Avenue, Pittsburgh, has let general contract to Harry Dunn, Inc., 1014 Locust Street, for one-story mechanical-bottling works. Cost about $40,000 with equipment.

Neville Township Board of Education, Municipal Building, Third and Grand Streets, Pittsburgh, asks bids until March 28 for equipment for industrial arts department in school; also for other school equipment.

NEW ENGLAND

Seamless Rubber Co., Inc., 253 Hallock Avenue, New Haven, Conn., plans one-story addition, 130 x 135 ft., for storage and distribution. Cost close to $50,000 with equipment. H. H. Davis, 29 Whitney Avenue, is architect and engineer.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until March 26 for naval brass forgings (Schedule 999), sheet steel blank shells and phosphor blank shells (Schedule 1025) for Newport, R. I., naval station; 30 galvanized iron or steel boat chains, 30 fathoms length (Schedule 1043) for Boston Navy Yard; until March 29, one open top pickling tank, rubber and brick-lined (Schedule 1058) for Portsmouth, N. H., yard.

Robert Gair Co., 155 East Forty-fourth Street, New York, corrugated shipping containers, floor display stands, etc., has plans by Mylchreest & Reynolds, 238 Palm Street, Hartford, Conn., architects and engineers, for new plant at Portland, Conn., one-story, 80,000 sq. ft. floor space. Bids will be asked soon on general contract. Cost about $135,000 with machinery.

Commanding Officer, Ordnance Department, Springfield Armory, Springfield, Mass., asks bids until March 25 for gages, including angle, check, flush pin, dovetail, snap, etc. (Circular 312); until March 26 for parts for machine guns, caliber .30 (Circular 313).

Superior Castings Corp., 133 Water Street, South Norwalk, Conn., has awarded contract to Hewlett Construction Co., 1385 Iranistan Avenue, Bridgeport, Conn., for alterations and foundry addition, to cost $40,000 without equipment.

WASHINGTON DIST.

Bureau of Yards and Docks, Navy Department, Washington, asks bids (no closing date stated) for steel caisson gates, including ballast, pumps, gate valves, motors, fittings and auxiliary equipment for Navy yards at Puget Sound, Bremerton, Wash., and Pearl Harbor, T. H. (Specifications 9440).

Rheem Mfg. Co., 30 Rockefeller Plaza, New York, steel barrels and containers, gas appliances, etc., plans one-story branch plant at Sparrows Point, Baltimore. Cost close to $50,000 with equipment.

General Purchasing Officer, Panama Canal, Washington, asks bids until March 26 for two kerosene tanks and parts for kerosene system (Schedule 3960); until March 25, one 7-cu. yd. concrete mixer (Schedule 3956); until March 27, twist drills, stone drills, files, auger bits, machine bits, wood boring bits, hacksaw blades, bolt dies, split dies, ship augers, bolt clippers, ratchet braces, breast drills, cold chisels, machinist's chisels, axes, clamps, lining bars, etc. (Schedule 3945).

Contracting Officer, Quartermaster Corps, Fort Monroe, Va., asks bids until March 25 for carriage bolts, anchor rods, guy clamps, anchor plates, cross arm braces, lag screws, washers, guy hooks, guy wire and other equipment (Circular 570-39).

Flynn & Emrich Co., 301 North Holliday Street, Baltimore, stokers and parts, has let general contract to W. R. Smith & Co., 3700 Beech Avenue, for one-story addition for storage and distribution. Cost about $40,000 with equipment. W. S. Austin, Maryland Trust Building, is consulting engineer.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until March 26 for one motor-driven precision bench milling machine (Schedule 1044), composition pipe fittings (Schedule 1005), cocks, valves, faucets, etc. (Schedule 962), about 125,000 aluminum cartridge tanks for 5-in. 0.38 caliber shells (Schedule 1102); until March 29, steel wire nails (Schedule 760), tilting-type, non-ferrous crucible furnace, 200-lb. crucible-diesel oil blower (Schedule 1006); until April 2, iron pipe fittings (Schedule 1007) for Eastern and Western yards; until March 26, 12,000 ft. of twin copper conductor under-water cable (Schedule 1032) for Bellevue, Anacostia, D. C.

SOUTH ATLANTIC

Commanding Officer, Ordnance Department, Augusta Arsenal, Augusta, Ga., asks bids until April 9 for one motor-driven precision jig borer (Circular 32); until April 11, hardness tester, electric spot welder, unit drives for shapers and other equipment (Circular 33).

Lance, Inc., 130 South Boulevard, Charlotte, N. C., food packer, has let general contract to J. J. McDevitt Co., Builders' Building, for three-story addition. Cost about $120,000 with equipment.

Spartanburg Pepsi-Cola Co., 729 South Church Street, Spartanburg, S. C., plans new one-story mechanical-bottling, storage and distributing plant at Greenville, N. C. Cost close to $45,000 with equipment.

SOUTH CENTRAL

Alabama Power Co., Birmingham, will begin superstructure soon on new steam-electric power plant at Chickasaw, Ala. Cost over $1,500,000 with equipment. This is part of 1940 expansion program.

United States Engineer Office, Second District, New Orleans, asks bids until March 25 for 4,200,000 ft. of special galvanized bridge wire strand, 9/32-in. diameter (Circular 356).

Director of Purchases, Tennessee Valley Authority, Knoxville, Tenn., asks bids until


NORTON SERVICE
..CONSULTING ENGINEERING
OPERATION Centerless
PART Shafts
MATERIAL Soft Steel
REMOVAL
LIMITS
REMARKS Best wheel ever used on cold rolled steel shafts.
WHEEL 90/2-P7BE
SIZE 20 x 1½ x 12"
MACHINE Cincinnati
WHEEL SPEED
OPERATION Cylindrical
PART Pinion shafts
MATERIAL Hardened steel
REMOVAL .020 to .030"
LIMITS
REMARKS Satisfactory - the best wheel they have had on this job. Gave them 10 pieces more per dressing.
WHEEL 1960/2-L5BE
SIZE 18 x 3-1/2 x 5"
MACHINE Norton
WHEEL SPEED Standard
OPERATION Surfacing
PART Stove top
MATERIAL Cast Iron
REMOVAL
LIMITS
REMARKS Freer cutting, longer life than four competitive makes.
WHEEL 3736/2-R5
SIZE 12 x 2½ x 1½"
MACHINE Robinson Automatic
WHEEL SPEED
OPERATION Snagging
PART Castings
MATERIAL Hard Malleable Iron
REMOVAL
LIMITS
REMARKS Ground 17½ tons of castings per wheel against competitor's average of 14. Wheel life 51-2/3 hrs. against 40 for competing wheel.
WHEEL 16/2-R4T-H
SIZE 20 x 1½ x 10"
MACHINE Floor Stand
WHEEL SPEED 1800 r.p.m.
OPERATION Snagging
PART Bath tubs, enamel ware
MATERIAL Cast Iron
REMOVAL Varies
LIMITS
REMARKS Best wheel ever used on this operation.
WHEEL 3714/3-S3T-H
SIZE 6 x 2½ x 2½"
MACHINE Portable
WHEEL SPEED
OPERATION Tool Grinding
PART Stellite Cutters
MATERIAL Stellite
REMOVAL
LIMITS
REMARKS Customer has tried for years to get a wheel which will grind cutters dry without checking. This wheel was very successful both for cut and life.
WHEEL 60-H5T
SIZE 6 x 2 x 5/8" 3/8" R, 1/2" B
MACHINE Milwaukee
WHEEL SPEED 2700 r.p.m.
OPERATION Cutting-off
PART Castings
MATERIAL Bronze, Aluminum & Monel
REMOVAL 4 to 5" cross section
LIMITS
REMARKS Best wheel ever used -- looks as if wheel life would be double that of competitor's.
WHEEL 16/6-S2R
SIZE 14 x 1/8 x 1"
MACHINE Tabor
WHEEL SPEED 3600 r.p.m.
HERE is concrete evidence of the value of Norton Consulting Engineering Service—actual samples from the Norton files—typical of thousands of grinding jobs solved by Norton engineers.
The Norton engineer in your territory will make a survey of all your grinding jobs on request. He has behind him the resources of the entire Norton organization—the specialists on various types of grinding—the vast files of data at the Worcester office—the research staff of trained technicians and laboratory workers.
Give Norton Consulting Engineering Service an opportunity to reduce your grinding costs.
NORTON COMPANY, WORCESTER, MASS.
New York Chicago Detroit Philadelphia
Pittsburgh Hartford Cleveland Hamilton, Ont.
W-753
NORTON ABRASIVES

March 27 for operating machinery for gates and segmental valves for navigation lock at Kentucky dam; until March 28, three 33,333-kva. vertical-shaft electric generators for units Nos. 1, 2 and 3, Watts Bar hydroelectric power plant.

SOUTHWEST

Board of Public Service, City Hall, St. Louis, will ask bids next month for boiler unit and superheater, and accessories (Contract 5022), for stoker and auxiliary equipment (Contract 5023) for power house at city hospital No. 1.

Board of Education, Sedan, Kan., has approved plans for one-story vocational shop at school, 34 x 123 ft. Cost over $45,000 with equipment. Joseph W. Radotinsky, Commercial National Bank Building, Kansas City, Kan., is architect.

Marquette Cement Mfg. Co., foot of Mott Street, St. Louis, plans new loading dock at 6601 Wharf Street, to replace present structure. Cost about $40,000 with conveyors and other mechanical-handling equipment. Main offices of company are at 140 South Dearborn Street, Chicago. J. L. McConnell, 111 West Jackson Boulevard, Chicago, is consulting engineer.

Charles A. Stoffer, 1744 East Thirteenth Street, Tulsa, Okla., will take bids soon on general contract for one-story plant, 45 x 100 ft., at 1231 South Detroit Street, for production of steel automobile springs and other steel specialties. Cost about $40,000 with equipment.

Transcontinental-Western Air Line, Municipal Airport, Kansas City, Mo., plans steel hangar, 200 x 300 ft., with shop and reconditioning facilities at municipal airport, Sixty-third Street and Cicero Avenue, Chicago. Cost over $80,000 with equipment. D. W. Tomlinson, first noted address, is chief engineer.

Brochsteins, Inc., 3400 Washington Street, Houston, Tex., bank and store fixtures and equipment, has let general contract to J. D. Bace Construction Co., 4009 Center Street, for new one-story plant, 105 x 380 ft., on Main Street Extension, near city limits. It will replace a plant recently destroyed by fire. Cost about $120,000 with equipment.

National Aircraft Corp., Trinity Life Building, Fort Worth, Tex., will begin work soon on two one-story additions to plant on Gillette Boulevard, San Antonio, Tex., 150 x 300 ft., and 80 x 200 ft. respectively for expansion in parts and assembling divisions. Cost close to $150,000 with equipment.

MICHIGAN DISTRICT

Dow Chemical Co., Midland, Mich., plans new plant on 800-acre waterfront property at Freeport, Tex., for extraction of bromine from water, storage and distributing buildings, machine shop, power house and other structures. Cost close to $5,000,000 with equipment. Austin Co., Cleveland, engineer, is engineer and contractor.

A.C. Spark Plug Division, General Motors Corp., Flint, Mich., has let contract to Indiana Bridge Co., Muncie, Ind., for new one, two and four-story plant, about 156,000 sq. ft., to replace present buildings which will be vacated on completion. Cost about $1,500,000 with equipment, instead of smaller amount previously noted.

United States Lake Survey Office, Detroit, asks bids until April 3 for one rotary lithographic offset press (Circular 8).

OHIO AND INDIANA

Midland Steel Products Co., Madison Avenue and West 106th Street, Cleveland, has let general contract to Gillmore-Carmichael-Olson Co., 1873 East Fifty-fifth Street, for one-story addition, 50 x 125 ft., for a heat-treating unit. Cost about $60,000 with equipment.

Ranco, Inc., 601 West Fifth Avenue, Columbus, Ohio, electric switches and controls, thermostats, etc., has let general contract to Frank Matthaes, 427 East Dunedin Road, for one-story addition, 60 x 240 ft. Cost over $85,000 with equipment. T. Wood Brooks, 329 East Broad Street, is architect.

B. F. Goodrich Co., Akron, Ohio, automobile tires and tubes, has let general contract to Indiana Engineering & Construction Co., 109 North Union Street, for three-story L-shaped addition, 89 x 130 ft., for expansion in chemical-manufacturing division. Cost about $175,000 with equipment.

Contracting Officer, Materiel Division, Air Corps, Wright Field, Dayton, Ohio, asks bids until March 25 for eight pneumatic routers, 40 lining cutters, 136 routing cutters, 24 roughing cutters, etc. (Circular 1192), taper pins, cotter pins and expansion plugs (Circular 1194); until March 26, 300,000 gasket, shielded spark plug coupling nuts (Circular 1181), propeller balancing stand bushings, propeller assembling posts and assembling post spacers (Circular 1199), valve assemblies, needle valve parts, regulator valves, five sump tanks, power unit, gyro stabilizer unit (Circular 1212); until March 28, 21 bench lathes, 15 jeweler's lathes, 43 engine lathes, 36 precision lathes, eight turret lathes, one bench lathe, one screw machine, all motor-driven (Circular 1168), 22 hydraulic cylinders (Circular 1218), 400 surface gages, 130 machinist's try-squares (Circular 1215); until March 29, carriage bolts with nuts, hexagonal head bolts, aluminum cap nuts, machine screw, steel, brass, and steel wing nuts (Circular 1222).

Continental Steel Co., West Markland Avenue, Kokomo, Ind., plans two one-story additions, 67 x 145 ft., and 30 x 54 ft. respectively. Cost over $70,000 with equipment.

Board of County Commissioners, Court House, Indianapolis, plans addition to Julietta power plant, Marion County, 58 x 71 ft., and improvements in present station, with installation of two 100-kw. turbine-generator units, three 130-hp. watertube boilers, forced-draft traveling chain grate stokers, water softener, pumps and auxiliary equipment. John M. Rotz Engineering Co., Merchants' Bank Building, is consulting engineer.

MIDDLE WEST

Clonick Steel Co., 1475 South State Street, Chicago, steel products, has let general contract to Robin Construction Co., 188 West Randolph Street, for one-story addition to plant at Twenty-fourth and Archer Streets. Cost about $45,000 with mechanical-handling and other equipment. Loebl & Schlossman, 333 North Michigan Avenue, are architects.

City Council, Marseilles, Ill., plans new municipal power plant. Cost about $200,000 with equipment. Samuel R. Hunter, 608 South Dearborn Street, Chicago, is consulting engineer.

Commanding Officer, Ordnance Department, Rock Island Arsenal, Rock Island, Ill., asks bids until March 25 for one vertical type, single-spindle drilling machine (Circular 759), gaskets (Circular 757), 1400 aluminum alloy hand cart wheels (Circular 760), aluminum alloy tubing (Circular 762).

Central Wisconsin Canneries, Inc., Beaver Dam, Wis., has let general contract to A. E. Hutter, 600 Madison Street, for one-story addition, 50 x 180 ft., for storage and distribution. Cost close to $50,000 with equipment.

Trane Co., La Crosse, Wis., heating specialties, air-conditioning equipment, etc., plans one-story addition. Cost about $60,000 with equipment.

Iowa Gas Engine Co., 207 Center Street, Waterloo, Iowa, plans one-story and part basement addition. Cost close to $40,000 with equipment.

Consumers Oil & Refining Co., Newcastle, Wyo., plans extensions in local oil refinery, including new production unit. Cost over $75,000 with equipment.

Public Service Co. of Northern Illinois, Joliet, Ill., has plans for expansion and improvements in steam-electric generating plant, with installation of new turbine-generator unit, boiler and accessory equipment. Cost about $750,000. Sargent & Lundy, 140 South Dearborn Street, Chicago, are consulting engineers.

Purchasing and Contracting Officer, Office of Quartermaster, Lowry Field, Denver, asks bids until March 28 for bolts, bushings, band saws, unions, couplings, ells, nipples and other equipment (Circular 117-16).

PACIFIC COAST

Lockheed Aircraft Corp., Empire Avenue and Victory Place, Burbank, Cal., has let general contract to H. W. Baum, 500 South Westmoreland Avenue, Los Angeles, for assembly building No. 8, one-story, 75 x 250 ft. Cost over $100,000 with equipment. John and Donald B. Parkinson, Title Insurance Building, Los Angeles, are architects.

Devon & McGraw, Verdugo Avenue and Lake Street, Burbank, Cal., have awarded general contract to Horace Shidler, 5504 Hollywood Boulevard, Los Angeles, for two-story plant, 102 x 120 ft., for film-manufacturing and film-processing. Cost over $50,000 with equipment.

Bureau of Reclamation, Denver, asks bids until March 27 for six welded plate-steel oil storage tanks for Shasta power plant, Kennett Division, Central Valley project, Cal. (Specifications 1342-D).

V-O Milling Co., 1542 Calada Street, Los Angeles, plans one-story addition to flour mill, 120 x 170 ft. Cost over $65,000 with elevating, conveying and other mechanical-handling equipment; work to begin early in summer. Blaine Noice, 5436 Carleton Way, is engineer.

Board of Trustees, J. M. Perry Trade School, Yakima, Wash., care of John W. Maloney, Larson Building, architect, has plans for new trade school on 50-acre tract near municipal airport, recently purchased, including one-story shops, administration building, power house and other structures. Cost over $200,000 with equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until March 26 for two sets of frequency battery chargers, motor-driven, with base and switchboard (Schedule 978) for Alameda, Cal., Naval Air Station; two horizontal plain milling machines (Schedule 989); until March 29, heavy-duty radial drill (Schedule 1003), horizontal boring, drilling and milling machine (Schedule 1001), all motor-driven; hardness tester (Schedule 996), hydraulic press (Schedule 1000) for Puget Sound Navy Yard; motor-driven drill grinder (Schedule 1009) for Mare Island yard; two motor-driven rotary, horizontal swaging machines (Schedules 984) for Alameda station; until April 2, one electric oven (Schedule 1024) for San Diego Naval Air Station.

FOREIGN

Ministerio de Obras Publicas, Direccion de Obras Hidraulicas y Sanitarias, Caracas, Venezuela, asks bids until April 2 for one floating asphalt plant on steel barge, asphalt mattress and sinking plant on steel barge, diesel-powered steel tow boat, 13 steel barges and one motor boat. Parsons, Klapp, Brinckerhoff & Douglas, 142 Maiden Lane, New York, are consulting engineers.

Japanese Federation of Rayon Manufacturers, Tokyo, Japan, is organizing a subsidiary, capitalized at 30,000,000 yen (about $7,020,000), to build a new mill at Shanghai, China, for production of cellulose rayon products. Certain machinery for new plant will be secured from different idle mills of companies forming federation and remainder of equipment purchased. Cost over $2,000,000 with machinery.

Westinghouse Orders Up 43%

INCOMING orders in 1939 reached the third highest level in the company's history, Westinghouse Electric & Manufacturing Co. reports. Orders received during 1939 amounted to $214,239,044 compared with $149,662,776 in 1938, an increase of 43 per cent.

Unfilled orders at Dec. 31, 1939, were $70,821,960 compared with $40,188,150 at the end of 1938, an increase of 76 per cent. Net income was $13,854,365 compared with $9,052,773 in 1938, an increase of 53 per cent.